Super
Exhibit 17

SUFFOLK COUNTY COMPREHENSIVE WATER RESOURCES MANAGEMENT PLAN

2015

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County Executive

Executive Summary

Introduction

Water is the single most significant resource *f*or which Suffolk County bears responsibility. As the impact of Superstorm Sandy underscored, more than at any time in our history, we are obliged to come to terms, in every sense, with the water that surrounds us. Suffolk County's water quality is at a tipping point. We face an alarming trend in the quality of the water our families drink, compounded by impairment of many bodies of water in which our families play. Moreover, the source of these impairments has demonstrably degraded the wetlands that serve as our last line of natural defense against storm surge.

While today our drinking water generally meets quality standards, elevating levels of contaminants raise serious concern. Many of our rivers, estuaries and bays are impaired as result of eutrophication. Nitrogen, which primarily spews from residential septics and cesspools, as well as fertilizer, are the principal culprits that spur hypoxia, harmful algal blooms, diminution of sea and shellfisheries, and degradation of our protective natural infrastructure–wetlands and seagrass beds that act as wave and storm surge buffers [1] [2]. Sea level rise, which also contributes to marshland degradation, is projected to raise groundwater levels, increasing vulnerability to saltwater infiltration, and further compromising on-site wastewater treatment infrastructure largely composed of cesspools and septic tanks.

Perhaps nowhere have we seen the impact of nitrogen pollution in more stark terms than the Great South Bay. At one time, this bay produced more than half the clams eaten in our country. However, over the past quarter-century, the clam harvest in the Great South Bay has fallen by 93 percent, destroying an entire industry which once accounted for 6,000 jobs. While clams were once over-harvested, they have largely failed to recover due to recurrent brown tides fed primarily from nitrogen from septic systems and cesspools. We must

[1] Deegan LA, Johnson DS, Warren RS, Peterson BJ, Fleeger JW, Fagherazzi S, and Wollheim WM (18 Oct 2012) "Coastal Eutrophication as a Driver of Salt Marsh Loss" *Nature* : doi:10.1038

[2] Anderson ME, McKee Smith J, Bryant DB, and McComas, RGW. (Sept 2013), "Laboratory Studies of Wave Attenuation through Artificial and Real Vegetation" USACE, "It is generally acknowledged that vegetated coastal features such as wetlands can reduce the effects of surge, waves, and tsunami propagation."

decide if this type of impaired surface water body will be our region's future or if we can restore our bays to health.

In advance of the release of the 2015 Suffolk County Comprehensive Water Resources Management Plan ("Comp Plan"), this Executive Summary Update is spotlighting the Comp Plan's critical findings, and relevant post-Superstorm Sandy considerations, in order to spur a critical public dialogue about the scope of the problem and begin to frame near-term solutions. While many environmental issues related to groundwater and surface waters have arisen since the previous Plan (1987), one elemental condition has remained constant: the vast majority of Suffolk residents rely on on-site wastewater disposal systems that discharge to groundwater. In addition, fertilizer use, industrial and commercial solvents, petroleum products, pesticides and a host of other manmade contaminants have had profound and long-lasting impacts on groundwater quality, as well as on fresh surface waters and coastal marine waters into which groundwater and stormwater runoff discharge.

In the face of sea-level rise and extreme weather events, Suffolk County is compelled to devise the means and methods to live and thrive with the water beneath, by and around us.

Critical Findings

*"We have a million and a half people, **approximately 74%**, or roughly a million people, who are **not sewered**. This is probably the only place in the world with that large a density in this tight a space where the waste is going into a sole source aquifer immediately beneath us that we're drinking, and this is **a big concern**."*[3]

Downward Trajectory in Groundwater Quality:

1. Nitrogen is public water enemy #1, as **nitrate contamination** from unsewered housing and fertilizer use poses a threat to both drinking water supplies and coastal marine habitat and resources. Nitrogen-induced nutrient loading and eutrophication can lead to many negative impacts on estuarine environments including harmful algal blooms (HABs), hypoxia [little or…], and even anoxia [no oxygen];

2. Volatile organic chemicals (VOCs), another **priority contaminant group**, derived from commercial, industrial, and consumer use,

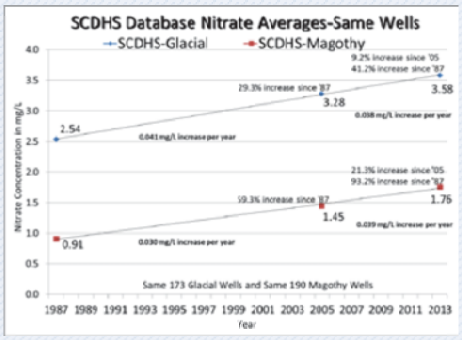
[3] Dawydiak, Walter, Acting Director Environmental Quality, Suffolk County Department of Health Services. Testimony to Health Committee of SC Legislature, March 6, 2012

impacting large portions of the aquifer, public water supply and private wells;

3. Pesticides pose a threat, especially to private wells in agricultural areas; and,

4. Pharmaceuticals and personal care products are an **emerging concern**.

Public Water Supply Well Nitrate Trends (1987-2013)



- Nitrogen pollution continues to worsen
- The rate of degradation has not declined; it appears to have accelerated in the Magothy aquifer
- Nitrogen levels in public supply wells are still generally good for drinking water, but unacceptable for surface waters

Surface Water Impairments:

5. Due to excess coliform bacteria and nitrogen, **many of the water bodies surrounding Suffolk County have been designated as impaired by the New York State Department of Environmental Conservation** (NYSDEC). In fact, the vast majority of Long Island's 60-mile long South Shore Estuary Reserve was declared impaired by the NYSDEC in 2010.

6. **Brown tide** algae invasions have been plaguing Long Island estuaries for nearly a quarter of a century, according to Dr. Chris Gobler of Stony Brook's School of Marine & Atmospheric Sciences (SoMAS), **obliterating a shellfish habitat** that once provided one half of all hard clams for the nation.

7. There was an 18-36% **loss of tidal wetlands** between 1974 and 2001 according to NYSDEC.[4]

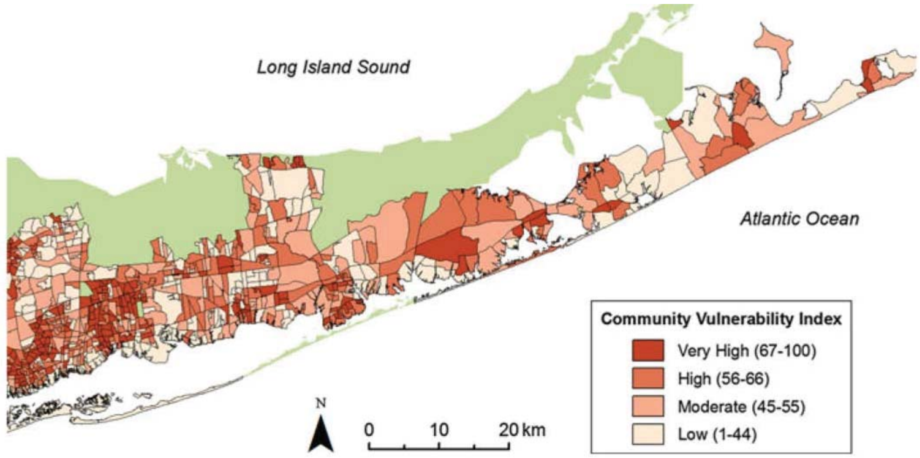
8. The NYS Seagrass Taskforce estimates that the 200,000 acres of seagrass in Long Island's bays and harbors in 1930 have shrunk by nearly 90% to 22,000 acres.

9. The Forge River in Moriches is "the worst case of anoxia (absence of oxygen) I have seen," states Dr. Larry Swanson, Associate Dean of SoMAS.

The costs of redressing water-related issues are significant; the economic consequences of not doing so are ***potentially devastating in property values alone****. Then there is Long Island tourism, producing revenues of $4.7B/yr, with approximately 28% of visitors – 5.1M/yr – visiting parks and beaches.*[5] *"Coastal habitats shield people and property from sea-level rise and storms," reducing*

[4] Discrete marsh trends show even higher rates of loss in other areas (TNC).
[5] Trust for Public Land, "The Economic Benefits and Fiscal Impact of Parks and Open Space in Nassau and Suffolk Counties, New York," 2010 accessed at http://cloud.tpl.org/pubs/ccpe--nassau-county-park-benefits.pdf

their exposure by half, according to marine ecologists at Stanford Woods Institute for the Environment.[6, 7]



The Community Vulnerability Assessment Tool (NOAA) identifies block groups that are at most risk, assessing damages resulting from a category 3 hurricane (gray) compounded 0.5m sea-level rise (black), + values of tidal marshes.[6]

Nitrogen from Unsewered Areas

Suffolk County, with a population larger than 11 states and a region that derives its drinking water from the ground, must pay particular attention to the 360,000 sub and non-performing septic/cesspools in Suffolk, accounting for well over 74% of the homes. They are particularly problematic in areas with high water tables and in close proximity to surface waters. When flooded or submerged in groundwater, septic systems do not function as designed and they fail to adequately treat pathogens. Excess nitrogen from sewage threatens our valuable natural resources, coastal defenses, and human health.

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[6] Arkema, K, "Coastal habitats shield people and property from sea-level rise and storms," Nature Climate Change, July 2013

[7] Shepard, C, et al, "Assessing future risk: quantifying the effects of sea level rise on storm surge risk for the southern shores of Long Island, New York," Nat Hazard 2011: 727-745.

Map of 0-25 Year Baseflow Contributing Areas to Surface Waters

Characteristics of Unsewered Areas in Suffolk County, N.Y.			
	Unsewered Residential Parcels		
	Total	Medium Density (> 1 to < 5 d.u./acre)	High Density *(≥ 5 d.u./acre)*
0-25 Year Baseflow Contributing Areas to Surface Waters	155,939	121,843	34,096
0-50 Year Estimated Groundwater Travel Time to Public Water Supply Wells	55,169	43,967	11,202
≤ 10 Feet Depth to Groundwater	38,143	25,914	3,288
≤ 10 Feet Depth to Groundwater AND either 0-25 Surface Water or 0-50 Groundwater Public Wells Contributing Areas	30,250	21,309	8,941

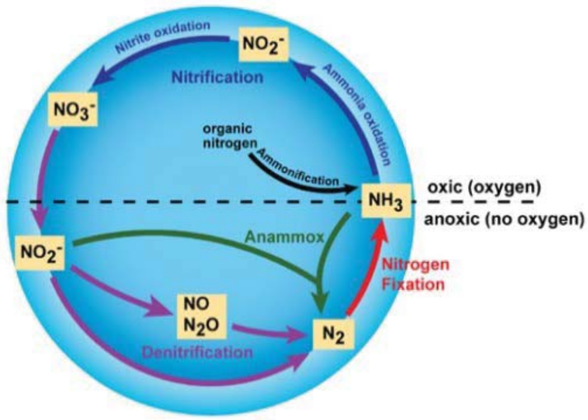
Suffolk County has identified priority high density (greater than 5 homes per acre) and medium density (1 to 5 homes per acre) residential subregions within the contributing areas with the following characteristics:

1. With a depth to groundwater of 10 feet or less; and/or

2. Contribute to an area that is listed as a 303(d) impaired water body.

Contaminant	Manmade Sources
Nitrogen pollution is increasing in our groundwater • While 83% of all community supply wells had nitrogen concentrations less than or equal to 6 mg/L in 2013, there were large changes in nitrogen levels in all of Suffolk County's groundwater aquifers. Nitrate concentrations in the Upper Glacial aquifer **rose by over 40%** between 1987 and 2013 while levels in the Magothy aquifer, a deeper aquifer, **rose by over 80%.** The observed rate of increasing nitrates was generally linear in the Upper Glacial aquifer between 1987 to 2005 and 2005 to 2013, but the trend increased slightly in the Magothy aquifer between 2005 to 2013 as compared to the rate of increase observed between 1987 and 2005 in the same subset of public supply wells. • Nitrate levels in nearly 25 percent of the private wells sampled between 2007 and 2013 exceeded groundwater management zone target levels of 4 and 6 mg/L. Nitrate levels in approximately 7 percent of the samples collected from 2007 through 2013 exceeded 10 mg/L. In some agricultural areas, nitrate levels in private wells can still exceed 20 mg/L. • Parts of Suffolk County's groundwater exceeds maximum containment levels caused by unsewered, subsized lots, especially in Huntington, Smithtown and northern Brookhaven, with nitrate levels ranging from 8 mg/L to 12 mg/L in Magothy wells in Northport and East Northport.	**360,000 septic and cesspools** 30,250 homes with septic systems or cesspools are within the 0-25 year contributing area to surface water and have less than 10 feet separating their systems from the water table
• All 3 major estuaries in Suffolk County are suffering from dissolved oxygen impairments as well as recurring Harmful Algal Blooms, some toxic to humans, diminishing the County's wetlands, which act as a second line of defense for storms. • Wetlands have been scientifically proven to reduce vulnerability from storm surge, reducing wave height by 80% over short distances. Waves lose energy as they travel through vegetation.	**80% of all fertilizer purchased in Suffolk is for non-farm, residential uses**
• Losses of healthy salt marsh have accelerated in recent decades. The NYSDEC estimates that an 18-36% loss in tidal wetlands in the Great South Bay occurred between 1974 and 2001. In 2010 the NYSDEC declared the vast majority of Long Island's South Shore Estuary Reserve system, stretching more than 60 miles, an "impaired water body" (under section 303(d) of the Clean Water Act). NYSDEC identifies nitrogen from wastewater as a reason for this unfortunate designation and states that cesspools, septic systems, and sewage treatment plants cause eutrophication, resulting in lower water oxygen levels and persistent algal blooms. According to researchers Kinney and Valiela[1], **69% of the total nitrogen load for the Great South Bay is from septic systems and cesspools**. • Excessive nitrogen has been shown to have a direct effect on seagrass by promoting growth of microalgae which shade it and macroalgae which out-compete it. Thousands of acres have died off in Long Island's Eastern and South Shore estuaries. According to the NYS Seagrass Taskforce, historic photography and records indicate that there may have been as much as 200,000 acres of seagrass in 1930 in Long Island bays and harbors; only about 22,000 acres remain. • A few decades ago, half the clams eaten in this country came from Great South Bay. However, in the past 25 years, the hard clam harvest in Great South Bay has fallen by more than 93% to record lows, resulting in a loss of more than 6,000 jobs[1]. In the 1970s, bay-scallop fishery on Eastern Long Island and hard-clam fishery in the South Shore bays were the two largest in the U.S. The bay-scallop collapse was almost entirely due to the nitrogen-caused algal blooms. While hard clams were over-harvested in the 1970s and 1980s, they have failed to recover largely due to recurrent brown tides.	25,905 tons of fertilizer were purchased as non-farm uses in 2012, representing 16% of all fertilizer purchased statewide

Contaminant	Manmade Sources
Volatile Organic Compounds (PCE, TCE, TCA, and MTBE) • Approximately **22% of public water supply wells are treated** to remove low-level VOCs prior to delivery to customers. • The gasoline additive MTBE, banned in 2004, was detected in 5% of all public supply wells tested in 2013, down from 16% with detections in 2005. • Concentrations of dry cleaning and metal finishing solvents **doubled in a 25-year period**, impacting between three (PCE) and five (TCE) times the number of wells. • 70% of community supply wells are rated as high or very high for VOC contamination, due to the widespread use of VOCs.	Illegal discharges & spills, leaking underground storage tanks, septic systems, household cleaners, and banned chemicals travelling through the aquifer
Pesticides • Past agricultural practices have significantly impacted private wells on the East End, with **6.5% exceeding pesticide maximum contaminant levels.** • Pesticides were detected in approximately 16% of the public supply wells sampled between 1997 and 2014. • **Over 100 pesticide-related compounds** have been detected in Suffolk's groundwater. • 20% of drinking water wells tested between 1997 and 2012 had at least one pesticide detection.	Agricultural sector and homeowners
Pharmaceuticals and Personal Care Products • Detection of pharmaceuticals and personal care products, like ibuprofen, phthalates, and caffeine, have been found in about **2.5% of community public supply well samples**, and 5 to 10% of (shallower) non-community public supply and private well samples. • The presence of **1,4-dioxane**, an industrial solvent stabilizer and byproduct in personal care products, has been found in over 40% of the Suffolk County Water Authority's public supply wells. This **emerging contaminant** is likely a human carcinogen and is not removed with conventional treatment technologies.	Industry and homeowners



Nitrogen Bomb in Our Bays

Nitrogen is one of the primary nutrients critical for the survival of all living organisms. Since the mid-1900s, the impact of humans on the global nitrogen cycle via manufacture of fertilizers and burning of fossil fuels has substantially altered the amount of fixed nitrogen in the Earth's ecosystems. Some predict that by 2030, the amount of nitrogen fixed by human activities will exceed that fixed by microbial processes.[8] Nitrogen is arguably the most important nutrient in regulating primary productivity and species diversity in aquatic and terrestrial ecosystems.[9]

Much of the nitrogen applied to agricultural and urban areas ultimately enters rivers and coastal systems. In nearshore marine systems, elevated nitrogen can lead to anoxia or hypoxia (no or low oxygen), altered biodiversity, alterations in the food-web, and habitat degradation. One common consequence of increased nitrogen is proliferation of harmful algal blooms.[10] Toxic blooms of certain types of dinoflagellates have been associated with high fish and shellfish mortality. Absent such economically catastrophic impacts, elevated nitrogen can lead to changes in biodiversity, species composition and overall ecosystem function. It has also been suggested that alterations to the nitrogen cycle may lead to increased risk of parasitic and infectious diseases among humans and wildlife.[11] Moreover, increases in nitrogen in aquatic systems can lead to increased acidification in freshwater ecosystems.

- Nitrogen is released when microorganisms break down sewage, manures, decaying plants or fertilizers, millions of pounds of nitrogen are generated on Long Island each year. As Chris Gobler of the Marine Science Research Center at Stony Brook University points out, "and unfortunately most of that, as we all know, is not going to sewage treatment plants, but is going to septic tanks" and eventually seeping into groundwater and surface water, Gobler said. **"We do expect these numbers to rise."**

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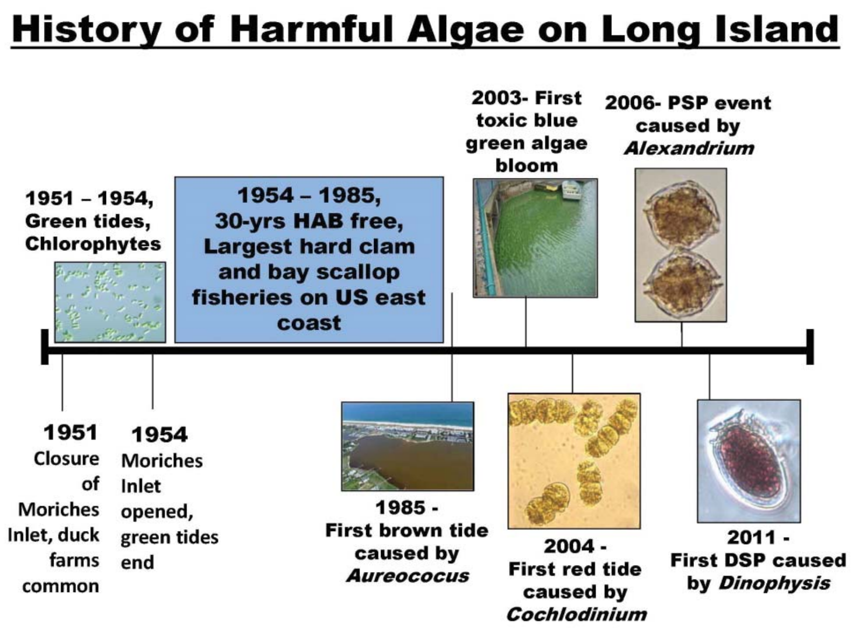
[8] Vitousek, P. M. *et al.* Human alteration of the global nitrogen cycle: sources and consequences. *Ecological Applications* **7**, 737–750 (1997).

[9] Vitousek, P. M. *et al.* Towards an ecological understanding of biological nitrogen fixation. *Biogeochemistry* **57**, 1–45 (2002).

[10] Howarth, R. W. Coastal nitrogen pollution: a review of sources and trends globally and regionally. *Harmful Algae* **8**, 14–20. (2008).

[11] Johnson, P. T. J. *et al.* Linking environmental nutrient enrichment and disease emergence in humans and wildlife. *Ecological Applications* **20**, 16–29 (2010).

- "The math, via nutrient budgets, that's been done – quantifying the precise amount of nitrogen in pounds per day from different sources including the atmosphere, fertilizers, septic tanks, cesspools, sewage treatment plants – clearly shows that the large majority is from cesspools and septic tanks, going from land into these **South Shore estuaries**," says Gobler. "The groundwater travels through the aquifer, it's going towards the bay. Tainted groundwater flows only a couple of feet a day. So, ironically, the bays may just now be getting hit with the effects of explosive development of the 1960s and '70s."



- Though submerged septic systems have not been thoroughly evaluated, such systems may very well diminish treatment of potentially pathogenic bacteria. "Excess nutrients (nitrogen and phosphorous) from both point and non-point sources from wastewater inputs can significantly impact surface water quality causing anoxia, hypoxia, eutrophication, nuisance algal blooms, dieback of seagrass and corals and reduced populations of fish and shellfish."[12]

[12] Paul, J.H., et al, "Rapid movement of wastewater from on-site disposal systems into surface waters in the Lower Florida Keys," Estuaries, Oct 2000, Vol23, Iss5, pp662-668.

	Suffolk County			New York State		
Year	Total Fertilizer	Farm	Non-Farm	Total Fertilizer	Farm	Non-Farm
2011	34,710.71	20.9%	79.1%	596,891.67	70.1%	29.9%
2012	32,432.19	20.1%	79.9%	590,819.23	72.7%	27.3%

2008-2012 Suffolk County non-farm fertilizer sales was 17.5% of NYS/Agriculture & Markets

- Though the element occurs naturally and is necessary for human health and plant growth, when ingested in high levels, it can deprive bodies of oxygen in blood. In infants, excess nitrogen in water used for formula preparation can lead to "blue baby syndrome," where the lack of oxygen turns the skin blue. In adults, high nitrogen levels, in severe cases, can lead to brain damage.

- Excess nitrogen is also harmful to coastal ecosystems. One important impact of nitrogen loading to coastal systems is low dissolved oxygen, or hypoxia. This occurs when decomposition processes outpace oxygen production and consume dissolved oxygen in the water column. Hypoxia can lead to fish kills and displace marine organisms, cause odors, alter sediment chemistry, and impact the food web.

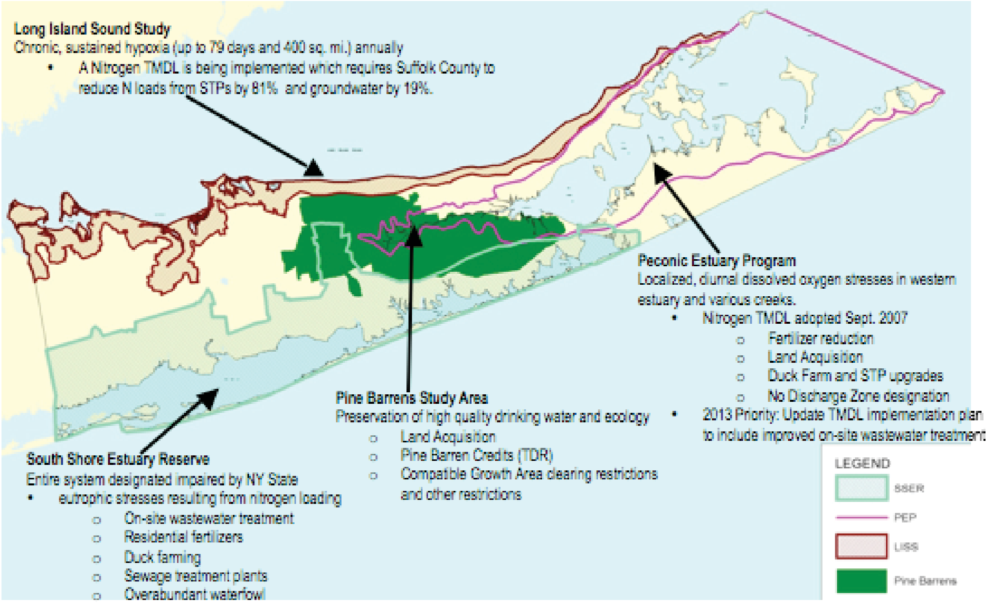
- In 2010 the NYSDEC declared the vast majority of Long Island's South Shore Estuary Reserve system, stretching more than 60 miles, an "impaired water body" (under section 303(d) of the Clean Water Act). NYSDEC identifies nitrogen from wastewater as a reason for this unfortunate designation and states that cesspools, septic systems, and sewage treatment plants cause eutrophication, resulting in lower water oxygen levels and persistent algal blooms throughout this important ecosystem.

- Note: Under the Clean Water Act, states, territories, and authorized tribes are required to develop lists of impaired waters. These are waters that are too polluted or otherwise degraded to meet water quality standards. The law requires that these jurisdictions establish priority rankings for waters on the lists and develop TMDLs for these waters. A Total Maximum Daily Load, or TMDL, is a calculation of the maximum amount of a pollutant that a waterbody can receive and still safely meet water quality standards.

Waterbodies that are designated as impaired will remain on the list until a TMDL has been developed. Waterbodies that are designated as impaired but no longer require a TMDL (usually because a TMDL has been developed) will be listed on the All Impaired Waters List.

- Drinking water safety and prevention of hypoxia are only two reasons Long Islanders are concerned about nitrogen loading. Other important impacts include harmful algal blooms (HABs), declining populations of recreationally and commercially important fish and shellfish, and degradation of wetlands and seagrass - important natural defenses against storms.

- The recurrence of nitrogen-caused low oxygen conditions, are the reason many of Long Islands bays are considered “impaired” (under section 303(d) of the Clean Water Act). For this reason alone, federal and state policies have mandated that nitrogen loads be reduced in the Long Island Sound and Peconic Estuary.



The Tides Are Turning on Us[13]

- October 15, 2013 – Brown tide algae, the color of coffee, has returned to Long Island's South Shore with concentration 20x what is harmful to shellfish in central Great South Bay and is 4x in other parts of the Great South Bay. Chris Gobler says such algal blooms have been forming in South Shore bays for at least the past 25 years.

- Since the 1980s, the Brown Tide causing algae A. anophagefferens has plagued Long Island Estuaries, and has been implicated in the crash of the hard clam population in Great South Bay and the iconic bay scallop population in the Peconic Estuary. In effect, the fate of the shellfish population is forewarning for the surrounding ecosystem of eel grass and marsh, like the proverbial canary in the coal mine.

- Since this particular strain of algae, A. anophagefferens, can exploit either inorganic or organic nutrients, it can potentially out-compete other co-occurring phytoplankton under some circumstances. As A. anophagefferens is adapted to grow under low light conditions and can utilize the available dissolved organic nutrients, it proliferates as the waning algal bloom uses up the inorganic nutrients and shades the water column with its biomass.

- Note that the **primary source of dissolved inorganic nitrogen** to many of Long Island estuaries is in fact **groundwater underflow**.

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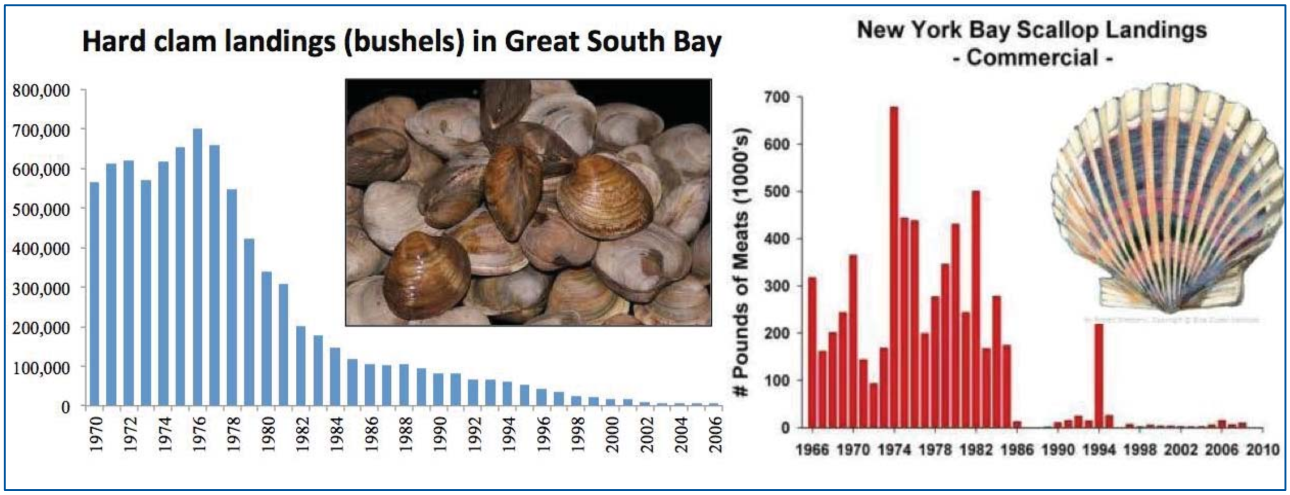
[13] http://www.seagrant.sunysb.edu/articles/t/brown-tide-research-initiative-what-s-new is the source for all material in this section

Reduced groundwater underflow combined with an organically enriched environment provide ideal conditions for the brown tide, allowing it to out-compete other species that rely on inorganic nutrients alone and higher light levels for photosynthesis.



- When hard clam populations were at their peak in Great South Bay in the 1970s, it has been estimated that the entire volume of Great South Bay was "filtered" through the benthic shellfish once every three days. With the dramatic decline in the hard clam population of Great South Bay, by 1993 the estimated time to filter the bay increased to once every 25 days. Field and laboratory results confirm the importance of these benthic filter feeders in helping to control *A. anophagefferens* populations. In tank experiments, under certain conditions, water filtration by hard clams prevented *A. anophagefferens* from blooming. These results suggest that the reduction in benthic filter feeders, such as hard clams, has caused a shift of the dominant grazers on phytoplankton from benthic filter feeders to the zooplankton grazers in the water column. Accordingly, a combination of a healthy population of benthic filter feeders and pelagic grazers could potentially control *A. anophagefferens* abundance and help prevent a brown tide.

- The red-tide, or **rust tide** organism ***Cochlodinium*** has appeared in Long Island waters every year since 2004, with an earlier than usual appearance in 2013. The Department of Environmental Conservation reported a fish kill at Cases Creek in Aquebogue on Aug. 2, finding killifish, snappers, and black sea bass, all with a coating of "orange slime." Gobler said, "Prior research in my lab has

demonstrated that these blooms are made worse by increased nitrogen into these bays."

- The **red-tide** algae, *Alexandrium*, produces saxitoxin, which causes *Paralytic Shellfish Poisoning*, resulting in numbness and tingling in the face and extremities, followed by headache, dizziness, nausea and a loss of coordination; more severe paralysis, respiratory failure and death can occur (NYSDEC). Saxitoxin accumulates in the tissues of molluscan shellfish, posing a human health threat which causes shellfish beds to be closed to fishing, and income to be lost. Blooms of this species began to occur annually in north shore bays on Long Island, but now regularly impact eastern and south shore bays including Mattituck Creek, Sag Harbor Creek, and Shinnecock Bay as well.

- The algae *Dinophysis* produces okadaic acid, which causes *Diarrhetic Shellfish Poisoning* resulting in gastro-intestinal symptoms which can be dangerous or even lethal in high-risk populations. This algae has also expanded its range on Long Island in recent years and has occurred in record concentrations in western Peconic tributaries.

- Another group of harmful algae, Cyanobacteria, have created harmful blooms with increasing frequency and extent in Suffolk County's fresh waters.

Why Are Protective Salt Marshes Falling Apart?

Too Many Nutrients[14]

- NYS 2100 Commission's report: "**Tidal wetlands can protect coastal communities** from storm damage by reducing wave energy and amplitude, slowing water velocity, and stabilizing the shoreline through sediment deposition."

- A 2013 report by the US Army Corps of Engineers concluded that **vegetated coastal features** such as marshlands **can reduce the effects of surge, waves**, and tsunami propagation.[15] Researchers have concluded that coastal wetland vegetation serves as a natural defense system against storm surges and waves along coastal regions, reducing wave height by 80% over short distances. Waves lose energy as they travel through vegetation.[16,17]

- Salt marshes are among the most biologically productive ecosystems on Earth and they perform many ecosystem services that are highly valued by society. "Salt marshes are a critical interface between the land and sea," Woods Hole scientist Linda Deegan says. "They provide habitat for fish, birds, and shellfish; protect coastal cities from storms; and they take nutrients out of the water coming from upland areas, which protects coastal bays from over-pollution."

- Losses of healthy salt marsh have accelerated in recent decades, with some losses caused by sea-level rise and development. The NYSDEC estimates that there was an **18-36% loss in tidal wetlands** in the Great South Bay between 1974 and 2001.[18] As the only South Shore bay with major riverine input, Great South Bay's living resources have been significantly affected by diminished tributary water quality.

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[14] Deegan LA, Johnson DS, Warren RS, Peterson BJ, Fleeger JW, Fagherazzi S, and Wollheim WM (18 Oct 2012) "Coastal Eutrophication as a Driver of Salt Marsh Loss" *Nature*: doi:10.1038.

[15] Anderson ME, McKee Smith J, Bryant DB, and McComas, RGW. (Sept 2013), "Laboratory Studies of Wave Attenuation through Artificial and Real Vegetation" USACE, "It is generally acknowledged that vegetated coastal features such as wetlands can reduce the effects of surge, waves, and tsunami propagation."

[16] Jadhav, Ranjit and Chen, Qin, "Field Investigation of Wave Dissipation Over Salt Marsh Vegetation During Tropical Cyclone" Coastal Engineering, 2012

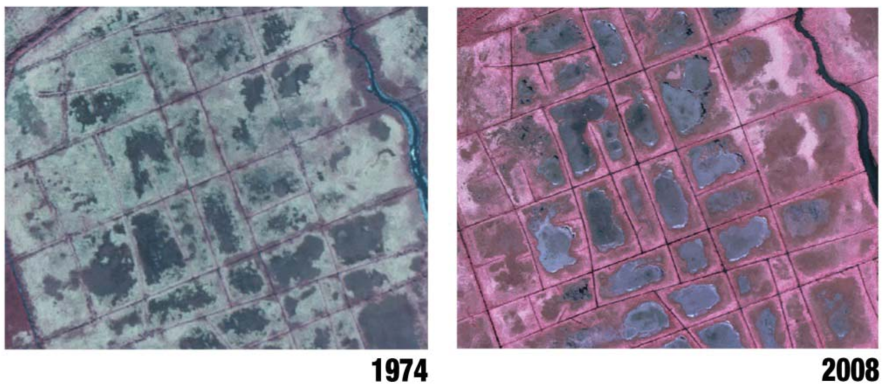
[17] Ysebaert, T, Yang, S.,Zhang, L., He, Q., Bouma, T., Herman, P. "Wave Attenuation by Two Contrasting Ecosystem Engineering Salt Marsh Macrophytes in the Intertidal Pioneer Zone" Society of Wetland Scientists 20 Sept 2011

[18] http://www.dec.ny.gov/lands/31989.html

- Based upon 36 years of nutrient enrichment in replicated field experiments, a team of scientists from Louisiana State University's Department of Oceanography and Coastal Sciences, the Coastal Systems Program at the University of Massachusetts-Dartmouth, and the Woods Hole Oceanographic Institution drew the following conclusions: "Enrichment reduces organic matter belowground and may result in a significant loss in marsh elevation equivalent to about half the average global sea level rise rates. Sustaining and restoring coastal emergent marshes is more likely if they receive less, not more, nutrient loading.... The salt marshes most vulnerable to changes in elevation will be those organic-rich salt marshes at the low end of their elevation range and exposed to relatively high nutrient loading.... An example of this situation might be in [neighboring] Jamaica Bay, New York, an estuary that has lost much of its salt marsh to fragmentation, and has had significant marsh dieback (near complete loss of vegetation in salt marsh parcels, with subsequent erosion and down-estuary transport of sediment away from the marsh platform).[19,20]

- Marsh loss through expansion of unvegetated pannes is a widespread phenomenon especially prevalent in northeast estuaries. As these unvegetated areas expand, the vegetated area of marsh and the delivery of ecosystem services from these marshes, like coastal protection from storm surges, are also lost.

Smith's Point North



[19] Turner, R. E. et al. Salt marshes and eutrophication: an unsustainable outcome. Limnol. Oceanogr. 54, 1634–1642 (2009).
[20] Hartig, E. K., et al. Anthropogenic and climate-change impacts on salt marshes of Jamaica Bay, New York City. Wetlands 22: 13–31. (2002)

- According to Coastal Resilience 2.0, a project of The Nature Conservancy, from '74-'08 Smith's Point marsh diminished by 28.31% and Gardiner Park by 33.67%.

- Excessive nitrogen has been shown to have a direct effect on seagrass by promoting growth of microalgae which shade it and macroalgae which out-compete it. Thousands of acres have died off in Long Island's Eastern and South Shore estuaries. According to the NYS Seagrass Taskforce, historic photography and records indicate that there may have been as much as **200,000 acres of seagrass in 1930** in Long Island bays and harbors; only about **22,000 acres remain**.

- Global decrease in estuarine and coastal ecosystems (ECEs) is known to affect at least three critical ecosystem services (Worm et al. 2006): the number of viable (non-collapsed) fisheries (33% decline); the provision of nursery habitats such as oyster reefs, seagrass beds, and wetlands (69% decline); and filtering and detoxification services provided by suspension feeders, submerged vegetation, and wetlands (63% decline). The loss of biodiversity, ecosystem functions, and coastal vegetation in ECEs may have contributed to biological invasions, declining water quality, and decreased coastal protection from flooding and storm events.[21]

- Like wetland systems, seagrass beds dampen wave energy and stabilize sediment, protecting Long Island's coastal communities from the impact of storms and flooding. "Larger seagrass bed width in the direction of wave propagation results in higher wave attenuation, and relative wave attenuation increases as incoming wave height increases.... A few authors have postulated that seagrass beds could reduce the energy that reaches shorelines, and potentially protect shorelines from being eroded"[22]

- Wetlands and seagrass beds are also critical to the resiliency of Long Island's marine food web to the impacts of storms and climate change, and ecological threats like eutrophication and harmful algal blooms. By providing the nursery habitat necessary for reproduction of key species at the base of the food web, these habitats are essential to the success of recreationally and commercially important finfish and shellfish.

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[21] Barbier EB, et al. "The value of estuarine and coastal ecosystem services." Ecol Monogr 2011;81:169–193.
[22] Chen S-N,et al. "A nearshore model to investigate the effects of seagrass bed geometry on wave attenuation and suspended sediment transport." Estuaries Coasts 2007;30:296–310.

- Coastal wetlands reduce the damaging effects of hurricanes on coastal communities by absorbing storm energy in ways that neither solid land nor open water can. The mechanisms involved include decreasing the area of open water (fetch) for wind to form waves, increasing drag on water motion and hence the amplitude of a storm surge, reducing direct wind effect on the water surface, and directly absorbing wave energy. Since marsh plants hold and accrete sediments, often reduce sediment resuspension, and consequently maintain shallow water depths, the presence of vegetation contributes in two ways: first by actually decreasing surges and waves, and also by maintaining the shallow depths that have the same effect.[23]

- "Coastal habitats – such as seagrasses, kelp forests, coral reefs, mangroves, wetlands, and dunes – can provide protection from erosion and inundation due to storm surge. Loss of these nearshore habitats can have dire implications, including damage to coastal infrastructure, private property, and loss of human life.... Existing coastal habitat protection laws aimed at reducing eutrophication of receiving waters also keeps in check those same biophysical processes that exacerbate ocean acidification." [24]

- "The number of people, poor families, elderly and total value of residential property {exclusive commercial} that are most exposed to hazards can be reduced by half if existing coastal habitats remain fully intact. Coastal habitats defend the greatest number of people and total property value in Florida, New York and California.... Large expanses of coastal forests and wetlands, oyster and coral reefs, dunes and seagrass beds (Supplementary Fig. S4) are critical for protecting the eastern seaboard.... Variation among counties in the value of property now protected by coastal habitats is substantial, ranging from US$0 (for example, Jefferson, Florida), to more than US$20 billion in ***Suffolk*** and Kings, New York." - Arkema, Katie K, et al, "Coastal habitats shield people and property from sea-level rise and storms," Nature Climate Change, July, 14, 2013.

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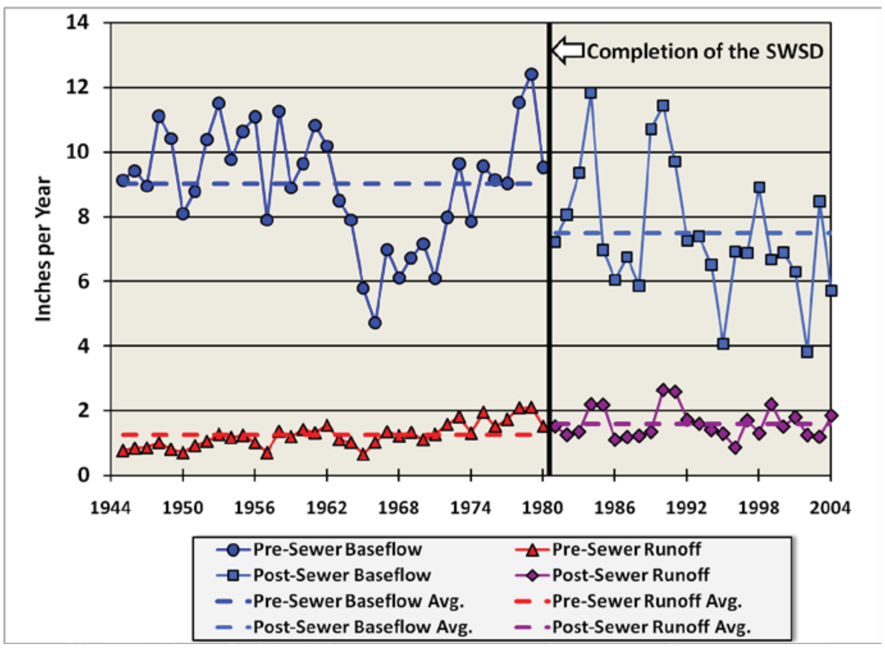
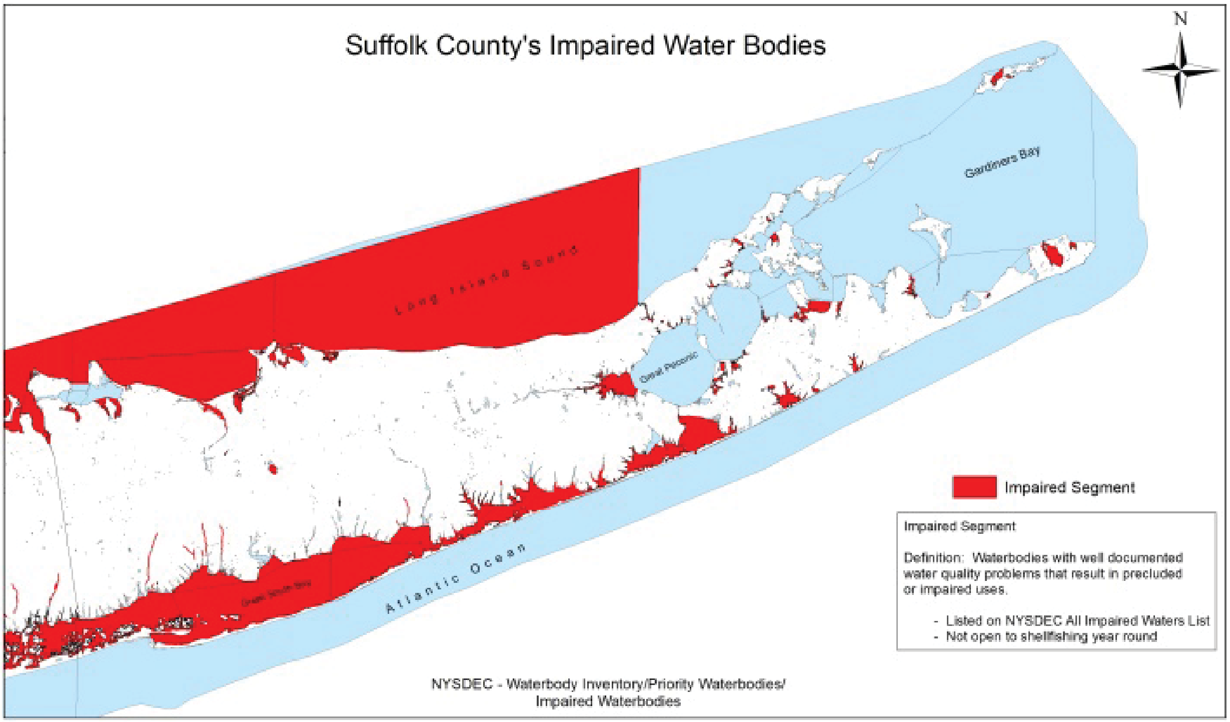
[23] Costanza R, et al. "The valueofcoastalwetlandsforhurricaneprotection." Ambio 2008;37:241–248.
[24] Ruckelhaus, M, et al, "Securing ocean benefits for society in the face of climate change," Marine Policy, Jan 6, 2013

contaminants. A review of water quality data characterizing twelve of the larger fresh streams in the County revealed that streams in the more densely developed western part of the County showed higher levels of VOCs than streams located further to the east, and that pesticides were primarily detected in streams in the agricultural eastern areas of the County. In general, as would be expected based upon their properties, VOCs have a lower rate of detection, and lower reported concentrations, in surface waters than in groundwater. Levels of MTBE, the most frequently detected VOC, appeared to be declining in recent years, probably because sale of gasoline containing MTBE as an additive has been prohibited in New York State since 2004.



Even after sanitary sewering was completed in the County's Southwest Sewer District, groundwater baseflow is the major source of streamflow.

The coastal waters bordering Suffolk County are impacted to varying degrees by contaminants introduced by point and primarily, non-point sources. Of the 38 classified saline waters in Suffolk County including the Long Island Sound and those that discharge to the Long Island Sound, 19 are identified as impaired according to the NYSDEC's *All Impaired Waters List*. This includes a large portion of the Long Island Sound as well as all of the county's north shore harbors (Huntington Harbor, Centerport Harbor, Northport Harbor, Nissequogue River, Stony Brook Harbor, Port Jefferson Harbor, Mt. Sinai Harbor and Mattituck Creek). Of the 120 classified saline waters included in



Quick Facts:

- *The SCDHS's Bureau of Marine Resources has been conducting water quality monitoring of the County's estuaries since the 1970's.*
- *Presently, routine monitoring is performed at over 200 stations from all 3 main estuaries (SSER, LIS, Peconic Estuary).*
- *Approximately 10,000 water quality samples are collected annually.*
- *Over 190 Bathing Beaches are monitored under §6-2 of the NYS Sanitary Code to ensure compliance with water quality standards.*

the Peconic Estuary, 41 are identified as impaired the largest of which include Flanders Bay and Reeves Bay. Of the 73 classified saline waters along the south shore including Great South Bay, the Atlantic Ocean, and those that drain to either of these waters, 33 are considered to be impaired. This includes, but is not limited to, the large bays along the south shore of the County (all of Great South Bay, Moriches Bay and Shinnecock Bay). The estuary programs have demonstrated that nutrients (particularly nitrogen) and pathogens are primarily responsible for use impairments and for stressing the living marine resources.

Within the Suffolk County watershed area, nonpoint sources are the major contributors of nutrients and pathogens. Recommendations identified by each of the estuary programs focus on reducing nitrogen loading from sanitary wastewater and fertilization, implementation of best management practices (BMPS) to improve stormwater quality, and open space preservation to improve water quality and reduce impacts on the ecology of Suffolk County's coastal waters. The cumulative impacts of these stresses on the overall health of the aquatic ecosystem are not well understood. Little is also known about the impact of emerging contaminants such as PPCPs on the marine resources; the cumulative impacts of pesticides and PPCPs on the aquatic ecosystems have not yet been well defined, and are currently under study.

Non-point source contributions of nutrients, pathogens and other contaminants have been identified as the primary causes of surface water quality impairments in Suffolk County. Groundwater continues to provide close to ninety percent of baseflow to most streams in the County, and groundwater discharge is one primary source of nutrient loading to fresh and coastal surface waters. The groundwater models were used to delineate the land surface area contributing groundwater baseflow to the County's streams and coastal waters at time of travel intervals ranging from less than one year to fifty years as shown by **Figure ES-4.** Understanding the land use types within

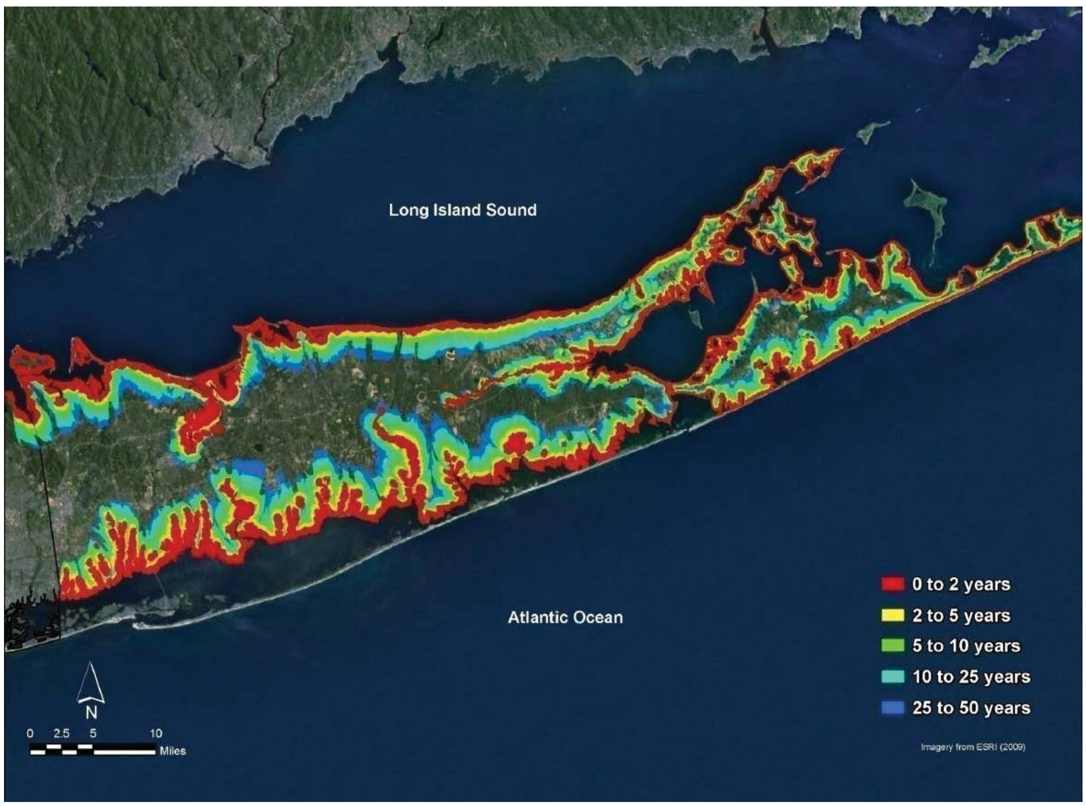


Figure ES-4 Precipitation falling upon the ground surface in the highlghted areas travels through the aquifer system to discharge to County streams, harbors, and other coastal waters. The time that it takes the water to travel from the water table to surface water discharge provides an indication of the time it will take for the effects of management actions to be reflected in the surface water quality.

the groundwater contributing areas to a stream can help to identify the sources of any observed contamination and to guide identification and evaluation of management options to improve water quality, as illustrated by **Figure ES-5.**

Wastewater Management Quick Facts:

Onsite Sewage Disposal Systems (OSSDS)

- *The #1 pollutant affecting Suffolk County's water resources is wastewater nitrogen*
- *Approximately 74% of SC is unsewered utilizing OSSDS*
- *There are an estimated 360,000 OSSDS located in SC*
- *Prior to 1972, block cesspools were the minimum required method of OSSDS for single-family homes*
- *After 1972, basic OSSDS for single-family homes, consisting of a 900 gallon septic tank and precast leaching pools*
- *An estimated 252,530 existing OSSDS pre-date the requirement for a septic tank*
- *Approximately 209,000 existing OSSDS are located in identified priority areas*
- *SC is evaluating the effectiveness of innovative alternative onsite wastewater treatment systems (I/A OWTS) for single-family dwellings to reduce wastewater nitrogen to 19mg/l through a County Sponsored demonstration project*
- *4 manufacturers (Norweco, Busse, Orenco Systems, and Hydro-Action) have agreed to install a total of 19 I/A OWTS within SC for the demonstration project (Systems to be installed in 2015)*

Projected water supply demands for the year 2030 were based on population projections provided by the SCDEDP and provision of community supply to all residents currently using private wells. Considering peak water supply pumping demands that are based on existing observed peak demand factors, the 2030 projections indicate that additional wells will be required in most Towns in the County. In fact, over one hundred new supply wells would be required in the County based upon projection of current peak water demand patterns. Alternatives to provide potable water to County residents, considering treatment, conveyance from the Pine Barrens, and conservation were identified and evaluated.

Wastewater Management

An estimated 69 percent of the total nitrogen affecting our ground and surface water supplies emanates from wastewater, specifically onsite sewage disposal systems.[27] Approximately 74 percent of Suffolk County is unsewered utilizing onsite sewage disposal systems with limited ability to reduce wastewater nitrogen.[28] There are approximately 360,000 onsite sewage disposal systems located in Suffolk County with approximately 209,000 of these systems located in identified priority areas meeting the following criteria[28]:

- Areas in the 0-50 year contributing zone to public drinking water wells fields
- Areas in the 0-25 year contributing zone to surface waters
- Unsewered parcels with densities greater than what is permitted in Article 6 of the Suffolk County Sanitary Code
- Areas located in an area where groundwater is less than 10 ft below grade

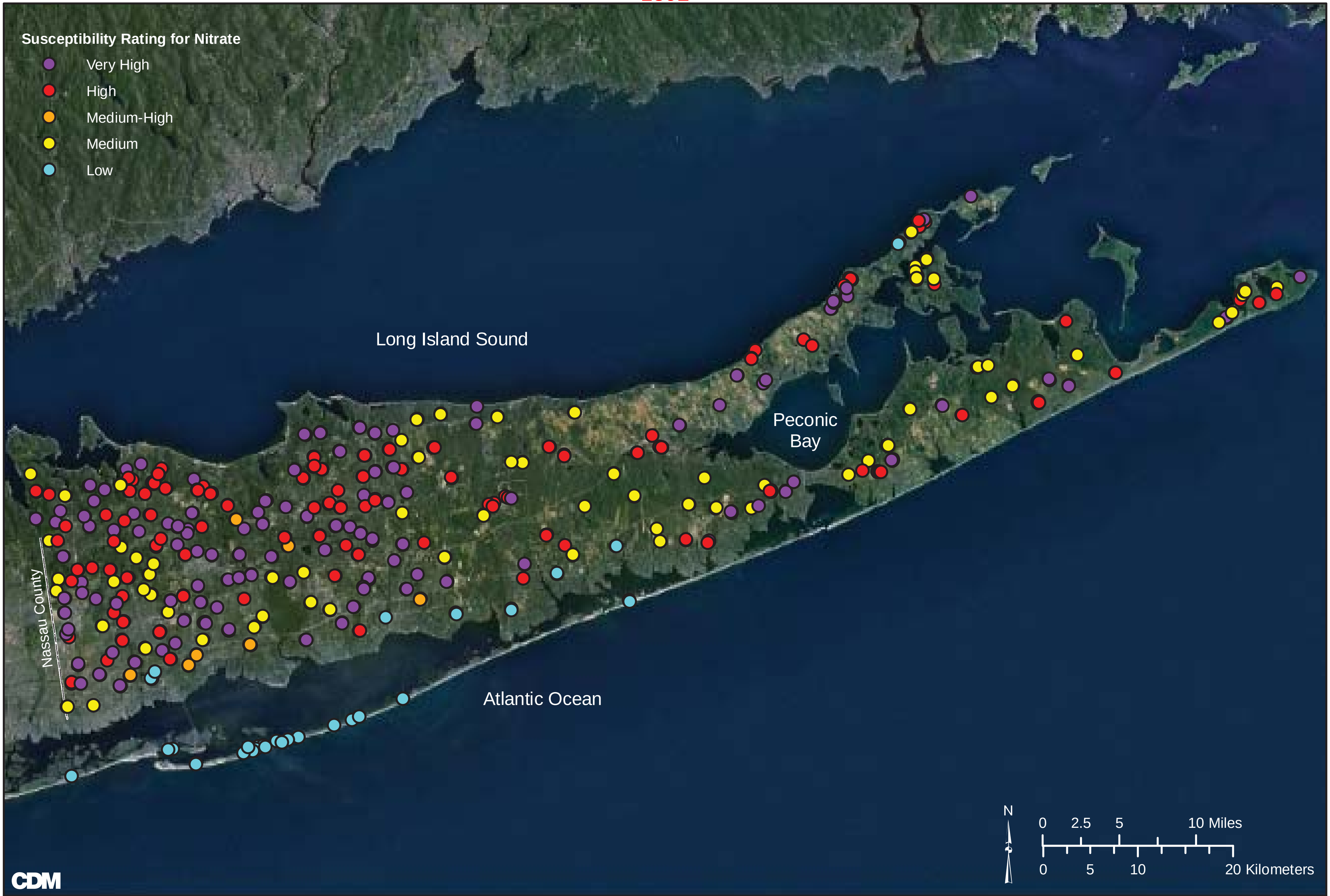
In 1958 the first SCDHS onsite sewage disposal Standards went into effect, requiring block cesspools for single-family homes. Up until 1972 these cesspools (AKA leaching pools) were permitted to be installed without a septic tank.

[27] [27]IBM Smarter Cities Challenge Report. Suffolk County, NY, United States. August 2014
[28] [28] SCDEDP, 2014

SUFFOLK COUNTY COMPREHENSIVE WATER RESOURCES MANAGEMENT PLAN

Section 3

GROUNDWATER RESOURCES



Community Supply Well Susceptibility Rating for Nitrate

Suffolk County Comprehensive Water Resources Management Plan

Figure 3-1

Nitrate levels in the same set of 175 public supply wells sampled in 1987 and 2013 have increased by an average of 1 mg/L, and nitrate levels in the same set of 213 Magothy public supply wells sampled in both 1987 and 2013 have increased by an average of 0.76 mg/L.

However, nitrate levels in nearly another third of the wells in the private well data base exceeded their respective GMZ target levels of 4 and 6 mg/L and nitrate levels in nearly ten percent of the 7,135 private wells sampled between 1997 and 2006 exceeded the 10 mg/L MCL. Fewer private wells were sampled between 2007 and 2013, but the pattern of contamination remained the same. Nitrate levels in nearly 25 percent of the wells for which coordinates were available (1,817) exceeded their respective GMZ target levels of 4 and 6 mg/L, and nitrate levels in approximately 7 percent of the 2,338 well samples collected from 2007 through 2013 exceeded the 10 mg/L MCL. Private wells impacted by nitrate contamination are located throughout the County, but most are found in agricultural areas of the North and South Forks and in pockets of the more densely developed unsewered areas of the north and south shores.

Changes in Nitrate Levels Since 1987

To assess changes in nitrate over time, average nitrate concentrations measured in community supply wells that were sampled in both 1987, (as documented in the ***1987 Comp Plan***) and in 2013 were compared. A summary of nitrate concentrations of samples taken from the same set of 390 public supply wells sampled in both 1987 and in 2013 is provided by **Table 3-1**. The data show that nitrate levels have increased in all three aquifers, and that nitrate concentrations in the same set of 175 upper glacial public supply wells sampled in both 1987 and 2013 have increased by an average of 1 mg/L as shown by **Figure 3-6a.** Nitrate concentrations in the same set of 213 Magothy public supply wells sampled in both 1987 and 2013 have increased by an average of 0.76 mg/L, as depicted by **Figure 3-6b.** Only one Lloyd aquifer well was sampled in both 1987 and 2013; the nitrate concentration in that well increased by 0.50 mg/L. **Figures 3-6a** and 3-**6b** also indicate that using data from all community supply wells to characterize aquifer conditions, nitrate levels, on average, have increased by nearly 0.4 mg/L in both the upper glacial and Magothy aquifers. Based on the limited data available to characterize the Lloyd aquifer, the average nitrate concentration has increased significantly. However, data was available from wells located in one general area on the north shore of the County and nitrate concentrations may not be representative of the Lloyd aquifer as a whole.

Nitrate levels in untreated groundwater samples collected from over 99 percent of all community supply wells complied with the 10 mg/L MCL in 2013; nevertheless, nitrate concentrations in all three aquifers continues to increase.

Overall, average nitrate concentrations remained less than or equal to 6 mg/L in nearly 83 percent of all community supply wells in 2013, and exceeded the drinking water MCL in untreated samples obtained from less than one percent of all community supply wells in 2013. While the overall assessment shows that nitrate levels remain in compliance with applicable standards in the majority of public supply wells, comparison of data collected from the same sampling

Table 3-1 Nitrate Concentration from Community and Non-Community Supply Wells

Aquifer	1987	2009-2013	2013	Same Set Wells 1987	Same Set Wells 2013
Upper Glacial Aquifer					
n (wells	714	570	477	175	175
Minimum (mg/L)	ND	ND	ND	ND	ND
Maximum (mg/L)	23.0	26.8	15.4	22.70	14.00
Average (mg/L)	3.05	3.40	3.44	2.63	3.69
10th Percentile (mg/L)	ND	0.14	ND	ND	ND
50th Percentile (mg/L)	1.90	3.00	3.10	1.80	3.55
90th Percentile (mg/L)	7.30	6.95	7.32	5.87	7.30
No. of Wells > 6 mg/L	135 / 116	133 / 91	86 / 82	20 / 17	37 / 35
Magothy Aquifer					
n (wells)	281	418	402	213	213
Minimum (mg/L)	ND	ND	ND	ND	ND
Maximum (mg/L)	12	10.9	10.2	12.00	10.20
Average (mg/L)	1.07	1.34	1.41	0.95	1.71
10th Percentile (mg/L)	ND	ND	ND	ND	ND
50th Percentile (mg/L)	ND	0.13	ND	ND	ND
90th Percentile (mg/L)	3.85	4.53	4.80	3.59	5.80
No. of Wells > 6 mg/L	18 / 13	39 / 23	29 / 26	12 / 8	21 / 19
Lloyd Aquifer					
n (wells)	4	6	5	1	1
Minimum (mg/L)	ND	1.90	2.1	1.60	2.10
Maximum (mg/L)	1.70	8.80	4.2	1.60	2.10
Average (mg/L)	1.24	3.72	3.18	1.60	2.10
10th Percentile (mg/L)	0.56	2.21	2.3	N/A	N/A
50th Percentile (mg/L)	1.55	3.15	3.50	N/A	N/A
90th Percentile (mg/L)	1.67	5.80	3.92	N/A	N/A
No. of Wells > 6 mg/L	0 / 0	2 / 1	0 / 0	0 / 0	0 / 0

Notes:
1. Data compiled from SCDHS databases.
2. Averages and percentiles calculated from annual well averages.
3. No. of wells > 6 mg/L is based on well maximum and averages, respectively (max/avg).

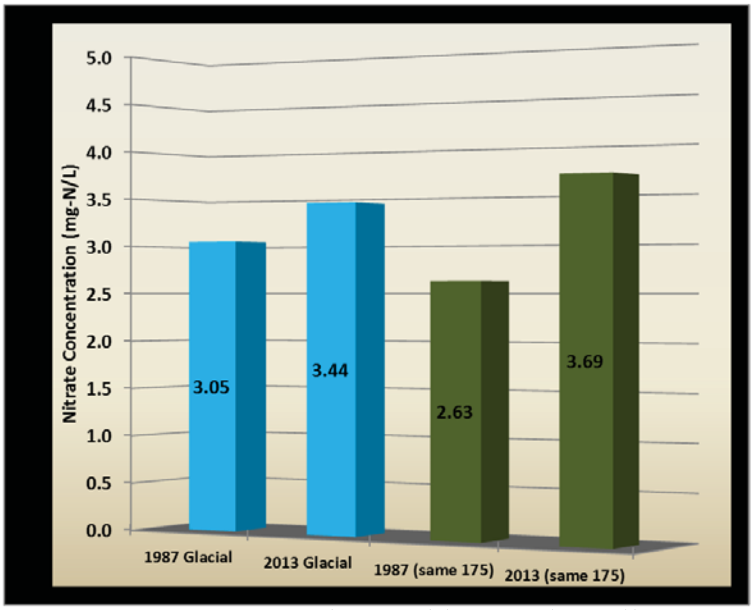


Figure 3-6a Nitrate Trends in Public Supply Wells Screened in the Upper Glacial Aquifer 1987-2013

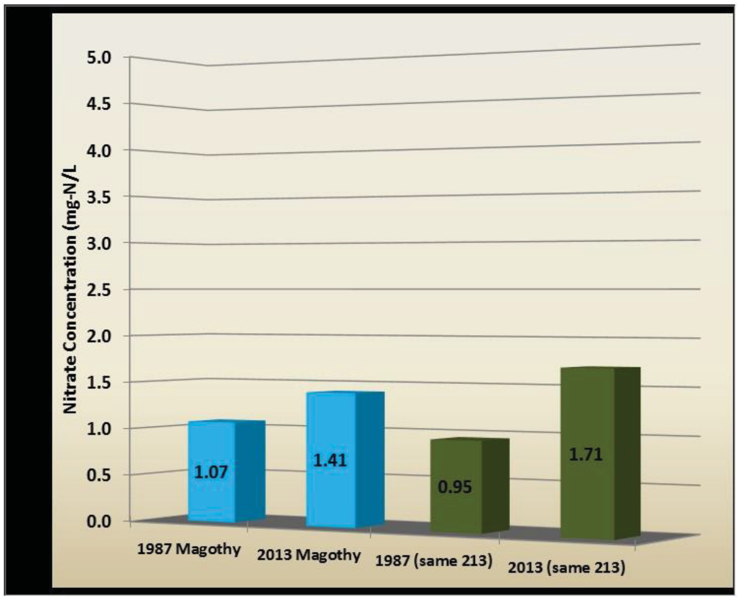


Figure 3-6b Nitrate Trends in Public Supply Wells Screened in the Magothy Aquifer 1987-2013

points in 1987 and in 2013 has revealed that nitrate concentrations have continued to increase in all aquifers, and that more deep public supply wells are being used to obtain better water quality.

Nitrate and Land Use

Several studies have investigated the impacts that various land use types have had on nitrate levels in Suffolk County groundwater, although a regional analysis has not been completed since the **1987 Comp Plan**. The **1987 Comp Plan** evaluated water quality from 25 shallow monitoring wells that were installed downgradient of specific land use types. **Table 3-2** summarizes the nitrate concentrations observed downgradient from the land uses studied. Results from the **1987 Comp Plan** study are shown graphically on **Figure 3-7** along with results from the **208 Study** (1978), based on nitrate data from wells in unsewered areas of Nassau County, and results from the WALRAS model developed by Cornell University (Dvirka and Bartilucci, 1987). This work was updated to consider more detailed assessments of land surface areas contributing recharge to public supply wells, historical land uses within the contributing or source water areas and estimated travel times from the water table to the supply well screen, as described below.

Historical Land Use and Nitrate Concentrations

The Suffolk County Department of Economic Development and Planning (formerly Suffolk County Planning Department) used historical aerial photographs to document changing land use within the contributing areas of 56 community supply wells located within 29 wellfields (please see Task 3 memoranda) over four historical time periods dating back to 1930. The Department of Economic Development and Planning (SCDEDP) used the contributing areas that were simulated during the Task 5.5 assessment of source water areas, based upon long term average conditions of precipitation and recharge and projected future water supply pumping rates, and intersected those source water areas with land use data from 1930, 1947, 1977 and 2004. The historical land uses were used to estimate the nitrate levels that could be expected in downgradient groundwater, and these estimates were compared to measured nitrate levels in the supply wells. Annual nitrate trend plots were developed for each of the 56 wells to qualitatively evaluate water quality trends resulting from changes in land use over time. The contributing area, historical land use data for each time period, and water quality data for SCWA's Woodchuck Hollow Road wellfield are included on the following page as **Figure 3-8**; the analysis of the other wellfields may be found in the Task 5.1 memorandum (**Past and Current Land Use Impacts**, CDM, 2010).

The average nitrate concentrations associated with each land use type that were documented in the **1987 Comp Plan** and the historical land use types

SUFFOLK COUNTY
COMPREHENSIVE
WATER RESOURCES
MANAGEMENT PLAN

Section 5
SURFACE WATER RESOURCES

Section 5
Surface Water Resources

Suffolk County's fresh and marine surface water resources are diverse and abundant; coastal waters form the County's boundaries to the north, east and south. In fact, the County's surface water features largely define the County's identity as a desirable location to live, work and play. Both the Long Island Sound and the Peconic Estuary have been designated as estuaries of national significance. The Long Island Sound (LIS) Comprehensive Conservation and Management Plan (CCMP) Summary reports that "Long Island Sound is a national treasure, to be prized for its beauty, abundant and diverse resources, and recreational and commercial opportunities." On the south shore, Coopers Beach in Southampton was named #1 in the nation by Dr. Stephen Leatherman (also known as Dr. Beach, Director of Florida International University's Laboratory for Coastal Research) on the 2010 list of the top ten beaches in the United States, and Main Beach in East Hampton was also identified as a National Winner. The County's harbors and estuaries also have great ecological value and significance; Great South Bay, part of the South Shore Estuary Reserve, is the largest shallow estuarine bay in New York State.

The 1987 Comp Plan enumerated and described the County's fresh surface waters and wetlands; that information is not reproduced here. The Long Island Sound, Peconic Estuary and South Shore Estuary Reserve have been the subjects of focused studies for years as documented extensively by the LIS and Peconic Estuary programs. The LIS CCMP, the Peconic Estuary CCMP and the South Shore Estuary Reserve (SSER) Comprehensive Management Plan (CMP) all identify a number of strategies and recommendations to improve water quality, reduce use impairments and protect/restore habitat and ecosystems in those marine systems, as well as the fresh surface waters that feed them. The surface water issues identified by the estuary programs, and the hundreds of recommendations incorporated into the estuary management plans are not repeated here, but are discussed in more detail in Section 6 of this document. Rather, this study evaluated the water quality of the County's fresh surface water features, particularly as it was impacted by the quality of groundwater baseflow, and reviewed trends in nitrogen levels in coastal water bodies. The status of implementation of the recommendations to protect and improve estuary water quality developed during previous studies was also assessed.

These reviews formed the basis for identification of recommendations that can reduce groundwater contamination; hence the quality of the groundwater

discharging to the surface waters will be improved, which will ultimately result in improved surface water quality.

In general, the recommendations for open space preservation, improved sanitary wastewater management, reduced fertilization, reduced stormwater impacts and enhanced public participation programs described in Section 3 of this Plan are all consistent with previous estuary program recommendations.

5.1 Problem Identification

5.1.1 Fresh Surface Water Resources

Suffolk County's fresh surface water resources are abundant and generally of sufficient quality to support multiple uses. Within the County, New York State has classified more than 200 freshwater streams and ponds and regulates over 1,050 freshwater wetlands covering nearly 24,000 acres (NYSDEC, 2006). The New York State Natural Heritage Program has identified over 50 coastal plain ponds in the County, distinguished by their rare ecological community type that supports rare and unusual plant species.

Many of the significant freshwater streams in the County are located along the County's south shore within the Southwest Sewer District (SWSD); however, some of the largest freshwater streams such as the Nissequogue, Connetquot, and Peconic Rivers are outside of the SWSD and the Flow Augmentation Needs (FANS) study area.

Suffolk County surface waters are regularly monitored, and their quality is assessed as part of other on-going programs, including New York State's identification of Impaired Waters under Section 303(d), the Long Island Sound Study (LISS), PEP and SSER programs (Task 6.1 - Freshwater Streams, Ponds and Wetlands, CDM, 2006; Task 6.2 - Coastal Marine Resources, CDM, 2007; and Task 6.3 - Estuary Study Recommendations, CDM 2008). Between 1966 and 2005, when staffing reductions forced a temporary reduction of the surface water monitoring program, SCDHS collected and compiled water quality data from over 113 streams. Thirteen streams were sampled by SCDHS in 2013/2014.

Table 5-1 lists the freshwater streams, segments and ponds identified in Suffolk County, along with their New York State use classification. The Suffolk County's water bodies on New York State 2014 303(d) list of impaired waters are highlighted on **Table 5-1**, along with the presumed cause(s) of the use impairments identified. NYSDEC has identified pathogens, metals, dissolved oxygen, phosphorus, ammonia, pesticides and silt/sediment as the primary contaminants causing impairment of the fresh surface waters, and storm water runoff as the source of these contaminants.

within a one year travel time is open space. VOCs were detected in stream samples collected from Sampawams Creek more than twice as often as in samples collected from the Carmans River. A review of land use types within the Carmans River watershed reveals that almost two thirds of the area that contributes groundwater baseflow to the Carmans River within a two year travel time remains open space, and over fifty percent of the entire groundwater contributing area is currently either open space or vacant land, as shown on **Table 5-5.** Not only does the open space reduce contaminant loading to groundwater, it provides a riparian buffer to protect the stream from contamination due to runoff.

Non-point source pollution controls and Total Maximum Daily Loads (TMDLs) are managed and implemented in New York State by the New York State Department of Environmental Conservation's (NYSDEC) Bureau of Water Assessment and Management. The Non-point Source Management Section works with federal, state, and local agencies and groups to develop TMDLs and address polluted runoff through the Non-point Source Coordinating Committee.

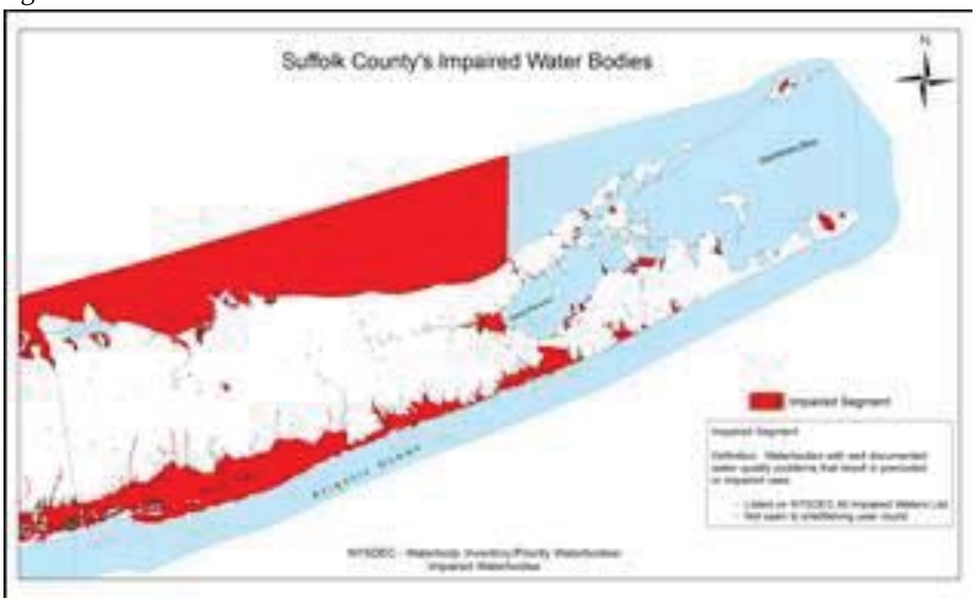
5.1.2 Coastal and Marine Resources

The quality of the County's coastal waters has been characterized using data collected by SCDHS from over 200 monitoring stations, shown on **Figure 5-6**. Coastal marine water body classifications and impairments identified by NYSDEC are summarized on **Table 5-6**. Nitrogen or aquatic toxicity concerns prompted the inclusion of fourteen water bodies, including portions of Great South Bay, Moriches Bay and five creeks on the 3c list, as shown. The presumed sources of the impairments included onsite wastewater treatment or urban runoff.

The coastal waters bordering Suffolk County are impacted to varying degrees by contaminants introduced by point and nonpoint sources. The estuary programs have demonstrated that nutrients (particularly nitrogen) and pathogens are primarily responsible for use impairments and for stressing the living marine resources. As of 2014, almost 30,000 acres are closed to shellfishing year-round, and approximately 9,000 acres are closed on a seasonal basis (NYSDEC, personal communication). Toxic contaminants also play a role in imparting stress on the living resources of Suffolk County's coastal waters. The cumulative impacts of these stresses on the overall health of the aquatic ecosystem are not well understood. Little is also known about the impact of emerging contaminants such as pharmaceuticals and personal care products (PPCPs) on the marine resources. The relative contribution of the sources of each of these contaminants of concern varies for each of the major coastal water bodies.

The management plans that are in place for the coastal waters bordering the County share many common issues and management strategies. Nitrogen and pathogens were identified as the parameters with the greatest impacts in terms of limiting uses and stressing the living marine resources. Within the Suffolk County watershed area, nonpoint sources are the major contributors of nutrients and pathogens, and recommendations identified within each of the estuary programs focus on reducing nitrogen loading from sanitary wastewater and fertilization, implementation of best management practices (BMPs) to improve stormwater quality, and open space preservation. The cumulative impacts of pesticides and PPCPs on the aquatic ecosystems have not yet been well defined, and are currently under study.

Not all impaired waters of the state are listed on the Section 303(d) list. By definition, the 303(d) list is limited to impaired waters that require the development of a TMDL. However New York State maintains a list of Other Impaired Waterbody Segments Not Listed on the 303(d) list to provide a more comprehensive inventory of waters that do not fully support designated uses. Waterbodies on this list are considered to be impaired, however a TMDL is not necessary. In some cases, this is because a TMDL has already been established for the segment/pollutant, or because urban stormwater runoff is identified as a source of impairment. **Table 5-7**, the All Impaired Waters List is a complete listing of all impaired water bodies (contains the Section 303(d) List waters as well as the Other Impaired Waterbody Segments Not Listed) as shown on the figure below.



5.1.2.1 Long Island Sound

As described in the Task 6.2 Memorandum, the Long Island Sound Study (LISS) was initiated in 1985 as a partnership between the United States Environmental Protection Agency (USEPA) and the states of New York and Connecticut. In 1987, the Long Island Sound was designated as an "Estuary of National Significance" under the National Estuary Program (NEP), which is implemented according to Section 320 of the Clean Water Act to protect nationally significant estuaries from pollution, development and overuse.

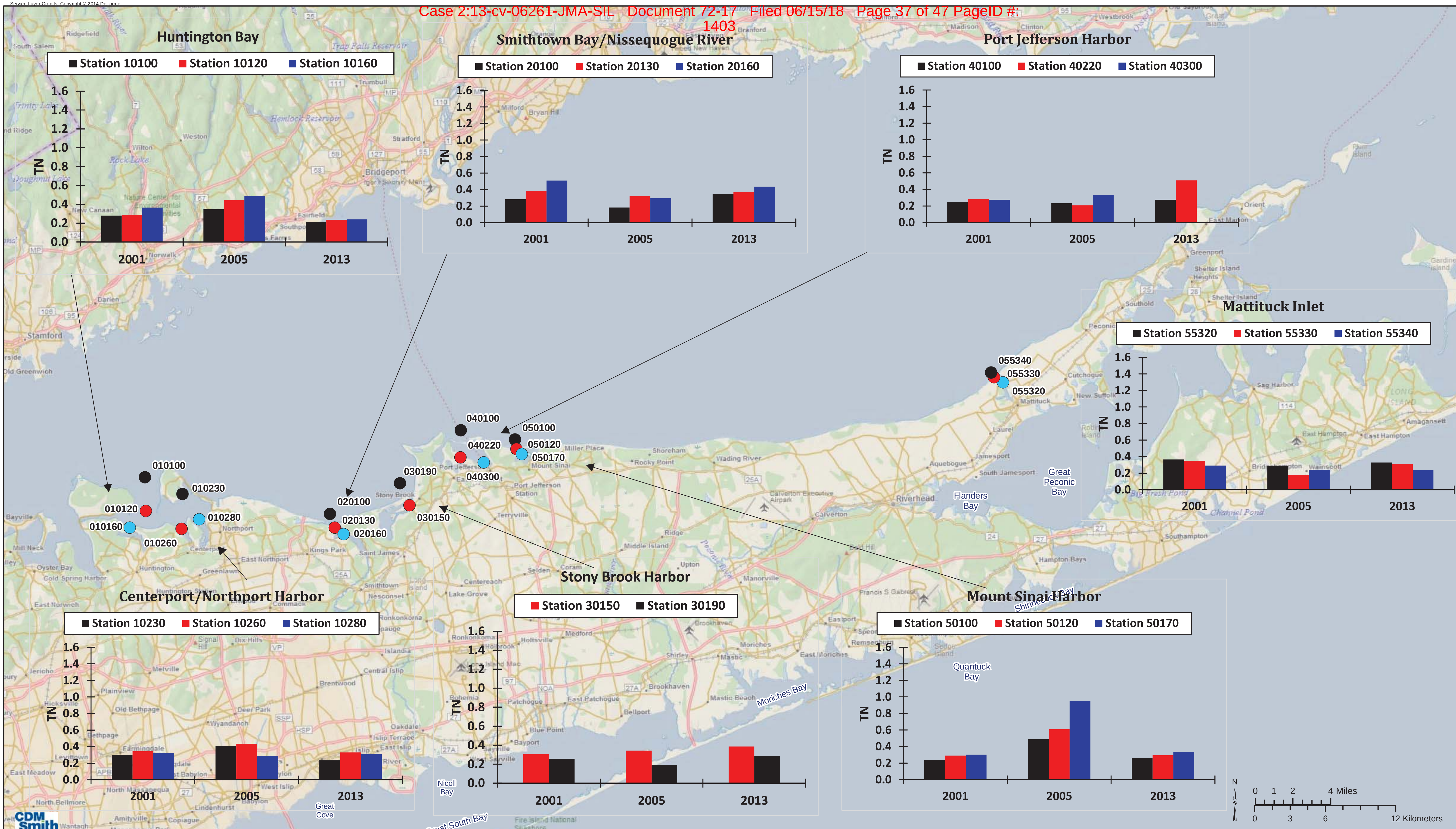
The LISS CCMP identified strategies to address:

- Low dissolved oxygen (DO);
- Toxic Contamination;
- Pathogen Contamination;
- Floatable debris;
- The impact of these water quality problems and habitat degradation and loss on the health of the living resource, and
- Land use and development resulting in habitat loss and degradation of water quality.

Nitrogen has been identified as the primary pollutant contributing to low dissolved oxygen levels and hypoxia in the Sound, which results in the subsequent loss of designated uses. Total nitrogen concentrations from 2001 to 2013 at select north shore embayment sampling stations are shown on **Figure 5-7**. In general, it appears that higher total nitrogen concentrations were observed closer to shore, and that nitrogen levels decreased moving northward towards the Long Island Sound. It is interesting to note that based on the limited set of sampling stations evaluated, average annual total nitrogen levels were generally lower at the Port Jefferson Harbor Complex stations than at the other sample points; it is hypothesized that these lower values may result from the fact that much of the drainage area is served by a sanitary sewer system.

Low levels of oxygen threaten many forms of aquatic life in portions of the Sound's bottom waters, typically between July and September when water temperatures are high. Because of the numerous and significant impacts, management efforts have focused on reducing major nitrogen inputs to the Sound.

The LISS adopted a TMDL for nitrogen to improve dissolved oxygen levels. However, the TMDL did not consider the nitrogen contribution from



Average Annual Total Nitrogen Concentrations (mg/L) by Year at Selected Sampling Locations within North Shore Embayments

Suffolk County Comprehensive Water Resources Management Plan

Figure 5-7

groundwater discharges. Working in partnership with NYSDEC, Suffolk County Department of Health Services (SCDHS) Office of Ecology developed the North Shore Embayments Watershed Management Plan

(Nelson, Pope and Vorhees, 2007) to reduce nitrogen loading to the LIS. The evaluation concluded that groundwater discharge is the most significant source of nitrogen to the Sound along the Suffolk County coastline; and the Plan identified a number of recommendations to reduce nitrogen loading.

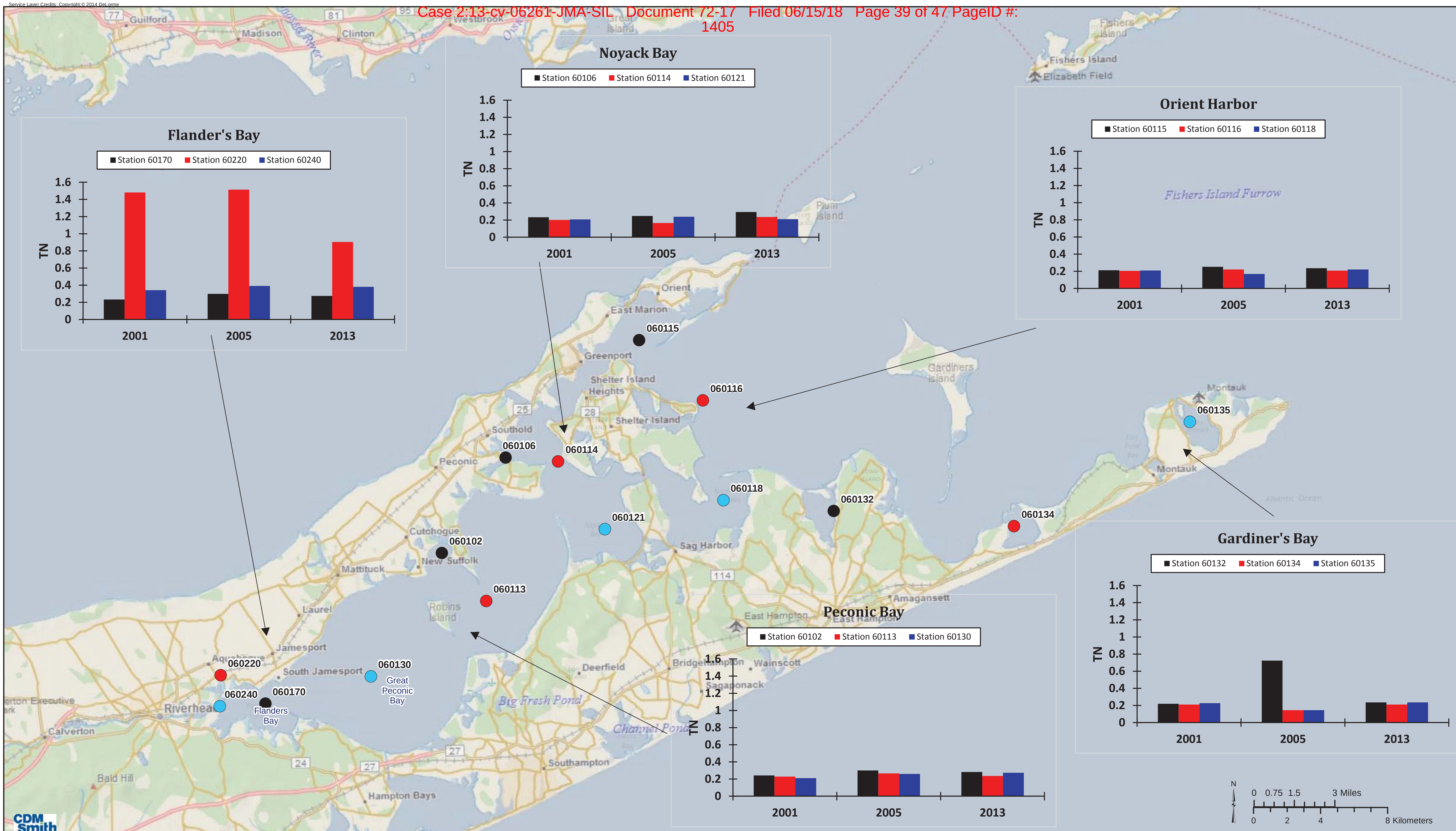
5.1.2.2 Peconic Estuary

The Peconic Estuary includes 120 classified bays, harbors, embayments, and tributaries encompassing 158,000 acres of surface waters. New York State and the Peconic Estuary Program (PEP) established a nitrogen Total Maximum Daily Load (TMDL) in 2007 to identify the nitrogen loading reductions needed to comply with dissolved oxygen criteria, and pathogen TMDLs were established for 20 water bodies within the Estuary to address coliform levels. Nitrogen trends at SCDHS sampling stations in the Peconic Estuary are shown on **Figure 5-8.**

The brown tide blooms in the mid-1980s and 1990s have caused significant reductions in the once abundant bay scallop population and have reduced the number of eelgrass beds, an important estuarine nursery habitat for finfish and shellfish. Eelgrass beds are now limited to waters near Shelter Island and to the east. Eelgrass beds, at about 1,550 acres as of 2010, are not expanding, despite generally good water quality. Because of the decline in bay scallops, commercial shellfishing operations have turned to the hard clams; however, there is some evidence of a decline in the hard clam population as well.

Some of the declines in the finfish population of the Peconic Estuary are attributed to over-harvesting and habitat degradation. Habitat degradation (feeding and spawning areas) has resulted from shoreline hardening, fertilizer and pesticide use, commercial trawling, recreational boating, historic oyster harvesting, and dredging.

Low dissolved oxygen conditions are evident in the western estuary's tidal creeks including Meetinghouse Creek, Sawmill Creek and at the mouth of the Peconic River. Nevertheless, recent trend analyses completed for SCDHS indicate that dissolved oxygen levels are increasing at many locations throughout the Estuary.



Average Annual Total Nitrogen Concentrations (mg/L) by Year at Selected Sampling Locations within Peconic Bay

Suffolk County Comprehensive Water Resources Management Plan

Figure 5-8

In a recent study of ten tidal creeks in the Peconic Estuary, four had a benthic community structure that was representative of other New York-area nutrient rich waters such as Jamaica Bay and the New York Harbor. The primary source of nitrogen was identified as a sewage treatment plant (STP) discharge, or in the case of Meetinghouse Creek, a duck farm. The low oxygen, nutrient-rich waters were noted for causing the low benthic diversity of the creeks. In each case, the density of a single amphipod species (which can better tolerate such conditions) was very high.

Nitrogen reductions as a result of TMDL implementation progress have resulted in reduced algal blooms and chlorophyll a levels. The reduction in algal blooms and increased dissolved oxygen concentrations have benefited both the benthic and pelagic organisms.

Lower pathogen levels have been observed at approximately half of the stations monitored through the estuary, as a result of fewer duck farms, improved stormwater management, pet waste cleanup and establishment of pump-out stations for boaters.

There is widespread use of pesticides on farms in the watersheds that drain to the estuary. Pesticides and their metabolites have been detected in surface waters, sediments and groundwater, occasionally at levels exceeding State drinking water standards. Little is known about the impact of herbicide and pesticide "cocktails" on phytoplankton, eelgrass, shellfish, and other living resources of the estuary. Other potential contaminants to the Peconic Estuary and other Suffolk County coastal waters include endocrine disrupting chemicals contained in pharmaceuticals, flame retardants and personal care products.

The effort to acquire open space is being outpaced by development, with nearly 600 acres of agricultural land and open space being developed each year. The loss of open space results in an increase in impervious surface and offers the potential for increased runoff with the possibility of degraded water quality. However, the development of agricultural land for residential, commercial, or similar uses could potentially result in less risk to the estuary, if proper stormwater controls are implemented in conjunction with development.

Trends in Peconic Estuary water quality have been documented in **Peconic Estuary Water Quality Status and Trends** (Cameron Engineering & Associates, LLP, 2012). **Table 5-8** summarizes water quality trends since the Comprehensive Conservation and Management Plan was adopted in 2001, indicating improvement in many water quality indicators.

Table 5-8 Changes in Water Quality Post CCMP

Parameter	Result	Trend
A.Anophagefferens	Consistently lower	Improved
Chlorophyll a	Generally lower	Improved
Dissolved oxygen	Generally higher or much higher	Improved
Fecal coliform	Generally decreasing	Improved
Nitrate and Nitrite	Generally higher	Declined
Total nitrogen	Generally lower	Improved in some areas, but some areas are higher post-CCMP
Organic nitrogen	Similar or slightly lower	Slightly improved
Total phosphorus	Generally much lower	Improved
Dissolved organic nitrogen	Similar or slightly lower	Slightly improved

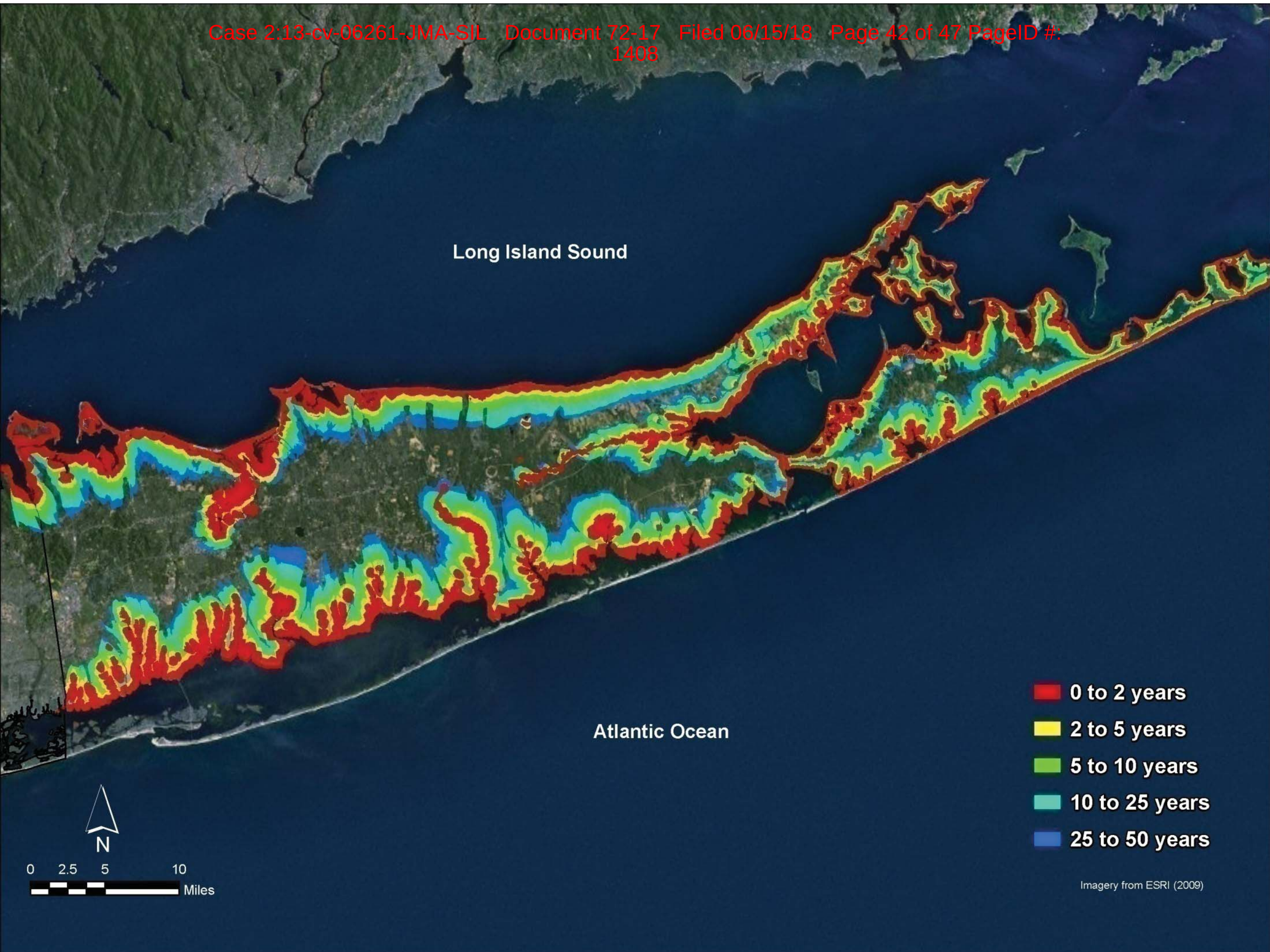
Note: Peconic Estuary Water Quality Status and Trends, 2012, Cameron Engineering and Associates, LLP

5.1.2.3 South Shore Estuary Reserve and Southern Coastal Waters

Impairments of the south shore waters result from pathogens from urban/stormwater runoff, and nitrogen from on-site wastewater treatment systems and urban/stormwater runoff. Although the shallow bays of the Reserve are generally well mixed, which enables reaeration and reduces oxygen depletion, low oxygen levels are typical along the northern margins of the bays and in the tributary mouths. Excess nutrients, in particular nitrogen, are responsible for eutrophication that triggers algal blooms that create low dissolved oxygen levels. The lack of oxygen threatens many forms of aquatic life in the Reserve. Fish kills have been noted in the Forge River, in response to hypoxic events believed to be triggered by excess nutrients.

The hard clam harvest in Great South Bay has fallen by more than 93 percent in the last 25 years. Shellfish, particularly the hard clams, provide important nutrient cycling and water filtration functions, and offer substantial recreational and commercial value as well.

The loss of salt marshes and other coastal habitats has reduced estuarine productivity and eliminated critical feeding and nursery habitat for finish, shellfish, shorebirds, and colonial water birds.


Long Island Sound
Atlantic Ocean
0 to 2 years
2 to 5 years
5 to 10 years
10 to 25 years
25 to 50 years
N
0 2.5 5 10
Miles
Imagery from ESRI (2009)

Appendix I

Suffolk County Sewage Treatment Plants

Table 1 - Suffolk County Sewage Treatment Plants (2014)

No.	Sewage Treatment Name	Sewage Treatment Type	Tertiary or Secondary	NYS SPDES Design Flow (MGD)	Discharge Location
1	Artist Lake	Extended aeration denite filter	Tertiary	0.025	Inland
2	Avery Village	SBR	Tertiary	0.025	Inland
3	Bellhaven Nursing Home	SBR	Tertiary	0.04	Inland
4	Birchwood @ Spring Lake	Extended aeration denite filter	Tertiary	0.25	Inland
5	Birchwood Glen	Extended aeration denite filter	Tertiary	0.1	Inland
6	Birchwood Nursing Home	SBR	Tertiary	0.02	Inland
7	Birchwood On The Green	Extended aeration denite filter	Tertiary	0.087	Inland
8	Blue Ridge	SBR	Tertiary	0.25	Inland
9	Bretton Woods	SBR	Tertiary	0.343	Inland
10	Bristal East Northport	Cromaglass	Tertiary	0.015	Inland
11	Bristal @ Lake Grove	Cromaglass	Tertiary	0.015	Inland
12	Encore Atl Shores Bristal Est.	SBR	Tertiary	0.04	Inland
13	Broadway Knolls	SBR	Tertiary	0.066	Inland
14	Broadway West	Cromaglass	Tertiary	0.015	Inland
15	Brookhaven Hospital	SBR	Tertiary	0.15	Inland
16	Brookhaven National Lab	Modular Aeration	Tertiary	1.2	Inland
17	Brookhaven SD #2	BESST	Tertiary	0.2	Inland
18	Brookhaven Town Hall	Extended areation denite filter	Secondary	0.026	Inland
19	Brookwood on the Lake	Bio disc denite filter	Tertiary	0.045	Inland
20	Browning Hotel Marriott Courtyard	SBR	Tertiary	0.056	Inland
21	Cabrini Gardens	Cromaglass	Tertiary	0.0071	Inland
22	Calverton Enterprise Park	Extended aeration	Secondary	0.078	Surface Waters
23	Calverton Hills	Extended aeration	Secondary	0.03	Inland
24	Cedar Lodge	Extended aeration	Secondary	0.03	Inland
25	Cenacle Manor	SBR	Tertiary	0.036	Inland
26	Chatham Holts RI Holt Hotel	SBR	Tertiary	0.02606	Inland
27	Chelmsford Weald Condo	Cromaglass	Tertiary	0.0099	Inland
28	Country Pointe	SBR	Tertiary	0.07	Inland
29	Country View Estates	SBR	Tertiary	0.0156	Inland
30	Country View @ Holtsville	BESST	Tertiary	0.015	Inland
31	Country View @ Smithtown	Cromaglass	Tertiary	0.063	Inland
32	Courtyard at Southampton	Cromaglass	Tertiary	0.015	Inland
33	Crescent Club	Extended Aeration	Secondary	0.03	Inland
34	Dowling	RBC denite filter	Tertiary	0.07	Inland
35	Eagles walk	Cromaglass	Tertiary	0.0428	Inland
36	East Port Meadows	Cromaglass	Tertiary	0.0081	Inland
37	Emanon Group	Cromaglass	Tertiary	0.00344	Inland
38	Emerald Greens	SBR	Tertiary	0.0186	Inland
39	Exit 63 Development	SBR	Tertiary	0.057	Inland
40	Fairfield at Mastic	Cromaglass	Tertiary	0.015	Inland
41	Fairfield at Selden	SBR	Tertiary	0.101	Inland
42	Fairfield Inn by Marriott	Cromaglass	Tertiary	0.015	Inland
43	Fairfield Lk Ronk	Cromaglass	Tertiary	0.015	Inland
44	Fairfield Village (Groton)	MBR	Tertiary	0.025	Inland
45	Fairhaven Apts. @ Nesconset	Extended aeration	Secondary	0.03	Inland
46	Fairway Manor	Extended aeration denite filter	Tertiary	0.0725	Inland
47	Fox Meadows	Extended aeration denite filter	Tertiary	0.034	Inland

Table 1 - Suffolk County Sewage Treatment Plants (2014)

2014 Suffolk County Sewage Treatment Plants (Continued Page 2)					
No.	Sewage Treatment Name	Sewage Treatment Type	Tertiary or Secondary	NYS SPDES Design Flow (MGD)	Discharge Location
48	Greenport Village	SBR	Tertiary	0.65	Surface Waters
49	Greens @ Half Hollow	SBR	Tertiary	0.3	Inland
50	Greenview Commons	SBR	Tertiary	0.03	Inland
51	Greenview Court	Cromaglass	Tertiary	0.0105	Inland
52	Greenwood @ Oakdale	Extended aeration denite filter	Tertiary	0.03712	Inland
53	Greenwood Village	Extended aeration denite filter	Tertiary	0.066	Inland
54	Gurwin Jewish Assisted Living	SBR	Tertiary	0.04	Inland
55	Gurwin Jewish Geriatric Center	SBR	Tertiary	0.045	Inland
56	Hampton Rehab Center	SBR	Tertiary	0.045	Inland
57	Hawthorne (Concord) Village	MBR	Tertiary	0.127	Inland
58	Heatherwood @ Holbrook	BESST	Tertiary	0.03	Inland
59	Heatherwood @Lakeland	Extended aeration denite filter	Tertiary	0.03	Inland
60	Heatherwood House @ Lake Ronk	Extended aeration	Secondary	0.03	Inland
61	Heritage Gardens at Brentwood	BESST	Tertiary	0.03	Inland
62	Hidden Ponds	Extended aeration denite filter	Tertiary	0.08	Inland
63	Hilton Gardens	SBR	Tertiary	0.022	Inland
64	Holiday Inn Express	Cromaglass	Tertiary	0.015	Inland
65	Holiday Inn	Extended aeration denite filter	Tertiary	0.04	Inland
66	Homestead Village	Extended aeration Susp. growth denite	Tertiary	0.115	Inland
67	Huntington Town	SBR	Tertiary	2.5	Surface Waters
68	Inn @ East Winds	Cromaglass	Tertiary	0.015	Inland
69	IRS	SBR	Tertiary	0.085	Inland
70	Island View	SBR	Tertiary	0.0554	Inland
71	Islandia Center	Extended aeration denite filter	Tertiary	0.055	Inland
72	Kensington Gardens st jamess NH	Extended aeration denite filter	Tertiary	0.075	Inland
73	LA fitness	BESST	Tertiary	0.0135	Inland
74	La Quinta	Cromaglass	Tertiary	0.015	Inland
75	Lake Grove Apqartments	SBR	Tertiary	0.08	Inland
76	Lake Pointe	Extended aeration denite filter	Tertiary	0.117	Inland
77	Lakes @ Setauket	Biodisc denite filter	Tertiary	0.0861	Inland
78	Lakeview Woods Bayport	Cromaglass	Tertiary	0.015	Inland
79	Larkfield Gardens Atria	SBR	Tertiary	0.016	Inland
80	Lexington Village	Extended aeration	Secondary	0.03	Inland
81	DSW Plaza Loehmans Plaza	RBC denite filter	Tertiary	0.0428	Inland
82	Mac Arthur Plaza	Extended aeration denite filter	Tertiary	0.015	Inland
83	Medford multicare center for living	SBR	Tertiary	0.05	Inland
84	Medford NH	SBR	Tertiary	0.05	Inland
85	Medford Ponds	BESST	Tertiary	0.0545	Inland
86	Melville Mall	Biodisc denite filter	Tertiary	0.04	Inland
87	Memorial Sloan Kettering	Cromaglass	Tertiary	0.005	Inland
88	Middle Island Co-op	Extended aeration	Secondary	0.015	Inland
89	Mill Pond Estates	BESST	Tertiary	0.05	Inland
90	Montauk Manor	Oxidation ditch	Tertiary (Seasonal)	0.03	Inland
91	Nesconset NH	Extended aeration denite filter	Tertiary	0.042	Inland
92	Newsday	Aerotor/MBR	Tertiary	0.045	Inland
93	North Isle Village	Extended aeration denite filter	Tertiary	0.11	Inland
94	Northport VA	Extended Aeration w/ Suspended Growth De	Tertiary	0.35	Inland
95	Northport Village	Extended aeration denite filter	Tertiary	0.45	Surface Waters

Table 1 - Suffolk County Sewage Treatment Plants (2014)

2014 Suffolk County Sewage Treatment Plants (Continued Page 3)					
No.	Sewage Treatment Name	Sewage Treatment Type	Tertiary or Secondary	NYS SPDES Design Flow (MGD)	Discharge Location
96	Oak Creek Commons	Cromaglass	Tertiary	0.0048	Inland
97	Oak Hollow NH	Extended aeration upflow denite filter	Tertiary	0.035	Inland
98	Oak Ridge Hollow	Cromaglass	Tertiary	0.015	Inland
99	Oakwood Care Center Affinity	SBR	Tertiary	0.042	Inland
100	Ocean Beach	Chemical Carbon Filter	Secondary	0.5	Surface Waters
101	Orchard @ Bulls Head Inn	Cromaglass	Tertiary	0.085	Inland
102	Patchogue NH	Extended aeration upflow denite filter	Tertiary	0.02	Inland
103	Patch Senior Conifer 16128	SBR	Tertiary	0.04	Inland
104	Patchogue Village	Aerotor/MBR	Tertiary	0.5	Surface Waters
105	Paumanok Village	SBR	Tertiary	0.0427	Inland
106	Petite Fleur	Extended aeration denite filter	Tertiary	0.027	Inland
107	Pine Hills S Mirror Ponds	SBR	Tertiary	0.0225	Inland
108	Pinewood Gardens	Cromaglass	Tertiary	0.0036	Inland
109	Plum Island	Extended aeration	Secondary	0.05	Surface Waters
110	Ponds @ Southampton Village	BESST	Tertiary	0.027	Inland
111	Preserves @ Connetquote	Cromaglass	Tertiary	0.01236	Inland
112	Quail Run	SBR	Tertiary	0.087	Inland
113	Radisson Hotel Best Western	Extended aeration denite filter	Tertiary	0.027	Inland
114	Residence Inn	Cromaglass	Tertiary	0.015	Inland
115	Riverhead Town	SBR	Secondary	1.3	Surface Waters
116	Rocky Point Apts.	Extended aeration	Secondary	0.03	Inland
117	Ross Health Care	BESST	Tertiary	0.015	Inland
118	Rough Riders Landing	Oxidation ditch	Tertiary (Seasonal)	0.032	Inland
119	Saddle Brook	Cromaglass	Tertiary	0.01485	Inland
120	Sag Harbor	SBR	Tertiary	0.25	Surface Waters
121	Sagamore Hills	SBR	Tertiary	0.08	Inland
122	Sayville Commons	SBR	Tertiary	0.1	Inland
123	SCC Riverhead	SBR	Tertiary	0.012	Inland
124	SCC Selden	Extended aeration denite filter	Tertiary	0.151	Inland
125	SD # 1 Port Jefferson	SBR	Tertiary	1.15	Surface Waters
126	SD # 12 Birchwood	SBR	Tertiary	0.12	Inland
127	SD # 13 Wind Watch	Extended aeration denite filter	Tertiary	0.4	Inland
128	SD # 14 Parkland	SBR	Tertiary	1.25	Inland
129	SD # 15 Nob Hill	Extended aeration Susp. Growth denite	Tertiary	0.09	Inland
130	SD # 18 Hauppauge Industrial Park	SBR	Tertiary	1.85	Inland
131	SD # 2 Tallmadge	SBR	Tertiary	0.4	Inland
132	SD # 20W Leisure Village	SBR	Tertiary	0.3	Inland
133	SD # 21 SUNY Stony Brook	Oxidation ditch	Tertiary	2.5	Surface Waters
134	SD # 22 Hauppauge County Center	Cannabal	Tertiary	0.202	Inland
135	SD # 23 Coventry Manor	Bio disc denite filter	Tertiary	0.07	Inland
136	SD # 28 Fairfield@St James	Extended aeration denite filter	Tertiary	0.07	Inland
137	SD # 3 Bergen Point	Aeration	Secondary	30	Surface Waters
138	SD # 5 Strathmore Huntington	SBR	Tertiary	0.236	Inland
139	SD # 6 Kings Park	SBR	Tertiary	1.2	Surface Waters
140	SD # 7 Twelve Pines	Extended aeration susp. Growth denite	Tertiary	0.65	Inland
141	SD # 7 Woodside	Extended aeration denite filter	Tertiary	0.4	Inland
142	SD # 9 College Park	Extended aeration susp. Growth denite	Tertiary	0.045	Inland
143	SD #11 Selden	SBR	Tertiary	1.757	Inland
144	SD 20E Ridgehaven	Extended Aeration denite filter	Tertiary	0.083	Inland
145	SD Gabreski Airport	SBR	Tertiary	0.1	Inland
146	SD Yaphank County Center	Bio disc denite filter	Tertiary	0.25	Inland
147	Setauket Meadows	SBR	Tertiary	0.03	Inland

Table 1 - Suffolk County Sewage Treatment Plants (2014)

2014 Suffolk County Sewage Treatment Plants (Continued Page 4)					
No.	**Sewage Treatment Name**	**Sewage Treatment Type**	**Tertiary or Secondary**	**NYS SPDES Design Flow (MGD)**	**Discharge Location**
148	Shelter Island Heights	SBR	Secondary	0.028	Surface Waters
149	Silver Ponds	RBC denite filter	Tertiary	0.0917	Inland
150	Smithaven Mall	SBR	Tertiary	0.125	Inland
151	Smithtown Galleria	SBR	Tertiary	0.17	Inland
152	Somerset Woods	Extended aeration	Secondary	0.03	Inland
153	Southern Meadows	SBR	Tertiary	0.118	Inland
154	Southampton Commons	SBR	Tertiary	0.04	Inland
155	Southampton Hospital	Bio disc denite filter	Tertiary	0.104	Inland
156	Springhorn @ Blue Point	Cromaglass	Tertiary	0.011	Inland
157	Spruce Ponds Garden Apts	SBR	Tertiary	0.008	Inland
158	St Annes Gardens	Cromaglass	Tertiary	0.015	Inland
159	Stone Ridge at Dix Hills	Cromaglass	Tertiary	0.015	Inland
160	Stonehurst III	SBR	Tertiary	0.21	Inland
161	Stonington @ Port Jeff	SBR	Tertiary	0.05	Inland
162	Stony Hollow	SBR	Tertiary	0.1	Inland
163	Stratford Green	MBR	Tertiary	0.152	Inland
164	Stratmore on the Green	Extended aeration denite filter	Tertiary	0.0615	Inland
165	Sunrise assited living Smithtown	Cromaglass	Tertiary	0.0105	Inland
166	Sunrise Dix Hills	Cromaglass	Tertiary	0.012	Inland
167	Sunrise E. Setauket	Cromaglass	Tertiary	0.011	Inland
168	Sunrise Garden Apts.	BESST	Tertiary	0.03	Inland
169	Sunrise Holbrook	Cromaglass	Tertiary	0.011	Inland
170	Sunrise Village	SBR	Tertiary	0.0229	Inland
171	Tall Oaks	Extended aeration	Tertiary	0.03	Inland
172	Timber Ridge @ Westhampton	Cromaglass	Tertiary	0.015	Inland
173	Towne House Village South	Extended aeration	Tertiary	0.03	Inland
174	Valley Forge	SBR	Tertiary	0.0746	Inland
175	Victorian Gardens	SBR	Tertiary	0.09	Inland
176	Victorian Homes @ Medford	SBR	Tertiary	0.01125	Inland
177	Village in the Woods 00130	Extended aeration denite filter	Tertiary	0.0878	Inland
178	Villages @ Lake Grove	SBR	Tertiary	0.065	Inland
179	Fairfield Villas @ Medford	Cromaglass	Tertiary	0.01485	Inland
180	Villas @ Pine Hills	Extended Aeration denite filter	Tertiary	0.181	Inland
181	Vinyards @ E. Morriches	Cromaglass	Tertiary	0.0065	Inland
182	Walden Ponds	SBR	Tertiary	0.056	Inland
183	Waterways @ Blue Point	Extended aeration denite filter	Tertiary	0.09	Inland
184	Waverly Park	SBR	Tertiary	0.03	Inland
185	West Hampton NH	Extended aeration denite filter	Tertiary	0.027	Inland
186	Westhampton Pines	SBR	Tertiary	0.031	Inland
187	Westhampton Senior Living	Cromaglass	tertiary	0.015	Inland
188	Whispering Pines	Extended aeration denite filter	Tertiary	0.105	Inland
189	Willow Ponds	SBR	Tertiary	0.07	Inland
190	Windbrooke Homes	SBR	Tertiary	0.065	Inland
191	Woodbridge @ Hampton Bays	Cromaglass	Tertiary	0.00485	Inland
192	Woodcrest Estates	SBR	Tertiary	0.04	Inland
193	Woodhaven Manor	Extended aeration	Secondary	0.015	Inland
194	Woodhull Garden Apartments	SBR	Tertiary	0.0335	Inland
195	Yardarm	Bio disc denite filter	Tertiary (Seasonal)	0.046	Inland